The persistence of the subjective in neuropsychopharmacology

Observations of contemporary hallucinogen research

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ABSTRACT

The discursive elimination of subjectivity through brain research by a neuroscientifically enlightened worldview and self-conception has been both hoped for and feared. But this cultural revolution is still pending. Based on nine months of fieldwork on the revival of hallucinogen research since the 'Decade of the Brain', this article examines how subjective experience appears as epistemic object and practical problem in a psychopharmacological laboratory. In the quest for neural correlates of (drug-induced altered states of) consciousness, introspective accounts of test subjects play a crucial role in neuroimaging studies. Firsthand knowledge of the drugs' flamboyant effects provides researchers with a practical wisdom not communicated in scientific publications, but key to the conduct of their experiments. By exploring these domains the paper points to a persistence of the subjective in contemporary neuropsychopharmacology and the constitution of the psychedelic experience as a human kind. This raises the question of how the effects of psychoactive drugs on the 'mind–brain' should be studied at the intersection of the human and the natural sciences.

SCIENCE AND EXPERIENCE

When I arrive in the EEG laboratory the experiment has already started. The room is only lit by the computer screen showing the subject's brainwaves. Looking through the observation window I cannot see anything at first glance. But as my eyes get used to the darkness I begin to make out the shaven-headed Zen master dimly illuminated by the monitor in front of him sitting bolt upright in the leather armchair. A tangled mass of wires seems to be coming out of the back of his head disappearing in the dark. Jan, a Swiss meditation teacher in his fifties, has been administered the hallucinogenic drug psilocybin to examine how it affects his ability to meditate. The young neuroscientist who invited me to witness this measurement in Franz Vollenweider's Zurich laboratory *Neuropsychopharmacology and Brain Imaging* is excited: While meditating Jan's brainwaves are particularly 'calm', he explains to me, showing comparatively strong activity in the alpha range.[1] After the measurement, Jan looks serene and happy. The researcher interviews him to learn more about the experience that went along with those unusual EEG patterns. Jan recounts that at the beginning he saw hideous faces and carnivalesque processions of ghosts. But then he remembered

the *Tibetan Book of the Dead* and reminded himself that these were only projections of his ego. Eventually, he resorted to a simple mantra that he had learned as a novice, a meditation over two words coupled with special attention to the physiological processes of inhalation and exhalation. Thereby, he managed to repel the spooky spectacle and was elevated to a 'higher state of consciousness' culminating in an experience of oneness with the universe. Much to his surprise and even disappointment this experience of cosmic unity was associated with the name of Jesus. It must have to do with his upbringing in a Christian family, he muses. He was relieved and delighted when subsequently thinking of Buddha further deepened this state of ego-dissolution. Compared to his everyday consciousness, he says, he gained a much more profound insight into the fact that the ground of all existence is love. 'Divine love', he specifies, 'or even better: being'. This occurred to him as an eternal truth: 'It has always been that way and it will always be that way. When reaching that state', he tells us, 'I thought: This is it! This is it!' The state he had been striving for during three decades of meditation exercises.

Early on during my anthropological fieldwork in Franz Vollenweider's laboratory at the Psychiatric University Hospital Zurich in 2005/6, I present some of my preliminary findings to the research group. Vollenweider made a name for himself in the early 1990s demonstrating similar metabolic patterns in brain scans of acutely schizophrenic patients and healthy test subjects under the influence of the hallucinogenic drugs psilocybin and ketamine (Vollenweider et al., 1997a; Vollenweider et al., 1997b). These studies helped reviving the use of hallucinogens as a model of psychosis (Vollenweider et al., 1998). In my presentation, which is primarily based on previously conducted interviews with researchers from neighboring Germany, I suggest that their pharmacological modeling of schizophrenia was primarily pragmatic and did not necessarily imply an ontological identity of intoxication and psychosis (Langlitz, 2006). In response, Vollenweider snarls at me: 'There is absolutely no doubt that hallucinogens cause psychosis. That's already the case by definition. There is nothing to *compare* [between inebriation and psychosis]. […] In psychiatry, all ego-dissolutions, including religious experiences, are pathological'.

Yet this vehement response is not motivated by the fact that Vollenweider has never experienced anything like the test subject described above. Under the influence of hallucinogens, he also reached states of ecstasy, in which he felt love and bliss suffusing himself and the entire universe. But he interprets these experiences as pipe dreams rather than revelations of a higher spiritual realm: 'It was real in my experience, but it was self-created, and it also satisfies my wishes. I cannot expand it into an intelligence that just wants everybody so happy'. (quoted in: Horgan, 2003: 154)

Together these two ethnographic vignettes point to the philosophical question of how subjective experience and neurophysiological accounts are related to each other. Since the 1960s, a number of philosophers have argued for the extreme position of eliminative materialism (Churchland, 1981; Feyerabend, 1963; Rorty, 1965), which, more recently, has come to incite a passionate debate in the German and Swiss feuilleton (Geyer, 2004b). In contrast to more moderate reductionists, eliminativists maintain that the neurosciences do not just explain, but explain away subjective experience in terms of objectively measurable neural activity. They present human experience as outright illusory. What feels like a free decision has been neurally determined before the subject actually takes the decision. Or, as in the case described above, what is

experienced as a mystical revelation of divine love is debunked as a drug-induced hallucination of metaphysical truth. The hard facts revealed by brain research are taken to contradict the subjective and therefore our mentalistic self-descriptions should be replaced by a neuroscientifically enlightened vocabulary. At the beginning of the twenty-first century, such discrepancies between experience and neurophysiological accounts have become paradigmatic in the public debate over the impact of brain research on our image of humankind. Accordingly, a collection of texts representative of the discussion in German-speaking print media is introduced by the following depiction of the problem:

> Our life is an illusion. This is the succinct conclusion with which neuroscientists clobber the scene. They say: You think that you're thinking, but in fact, you only think that you're thinking. In reality, nobody thinks, but the brain plays its neuronal game, in which the self doesn't have a say. So much the worse, they say, that the self is even taken in by the illusions, which the play of neurons constantly produces. Among these illusions are the self and its whole way of experiencing the lifeworld (Geyer, 2004a: 9).

However, in the course of my fieldwork in Vollenweider's laboratory, I came to realize that the prevalent objectivist image of cognitive neuroscience had to be qualified to apply to this particular case—and possibly not only to this case. Close ethnographic inspection revealed the persistence of the subjective in contemporary neuropsychopharmacology. First of all, as an object of study. The importance of introspective accounts in the neuroimaging studies described below is in tune with the well-established diagnosis of a reanimated neuroscientific interest in consciousness and the so-called first-person perspective (Baars, 2003a; Ferrari & Pinard, 2006; Maasen, 2003; Roepstorff, 2003). However, it is not only the subjectivity of test subjects, but also that of the neuroscientists themselves, which will be shown to play a crucial role in their experimental practice.

As a case study, this article presents findings that are neither universal nor particular, but significant. Hallucinogen research is certainly a somewhat exotic and marginal terrain within neuropsychopharmacology and the effects of the drugs studied can only be described as quite exceptional. Additionally, the politicization of hallucinogens in the 1960s and the ensuing breakdown of the field from approximately 1970-1990 has left its marks. But the revival of hallucinogen research since the 'Decade of the Brain' has been accompanied by sustained efforts to return these ostracized substances to mainstream science and society (Langlitz, forthcoming). Thus the methods applied by Vollenweider and his co-workers (EEG, neuroimaging, neuropsychological tests, self-rating scales) are conventional and widely employed in cognitive neuroscience—and yet they are far from eliminating subjectivity from the research process and its results.

THE SUBJECT'S SUBJECTIVITY

In his protocol, a test subject of the Vollenweider laboratory describes how he experienced a PET scan under the influence of psilocybin:

> At the beginning of the trip I suddenly felt an urge to lie down in the lab. At that point, the optical 'distortion' began. First, I saw that some structures were moving and took up different colors and forms. From the gurney, I looked at the sink and the soap dispenser on the wall. All of a sudden, they looked as if they had been painted—as if you apply a filter to an image, which makes it look like an oil painting. Before the scan, I went to the toilet, but I didn't find my bearings there. All proportions were wrong: the toilet seemed to be huge, my hands were too big, the arms too long. The first minutes of the scan were also strange. When I realized the scientist in the corner of my eye, he looked like a rat, and the assistant's face was a zombie-like grimace. As soon as I closed my eyes, my perception changed abruptly and totally. I was gliding through bizarre geometric spaces, mostly cubic and intensively red. My field of vision was enormously wide, up to 270°, at the corners of which I perceived whispering human figures. Only with great effort, could I afterwards fill in the questionnaires. The answers did not seem suitable or too undifferentiated. Sometimes I did not understand the questions. But it was fascinating that I could read at least half of the questions on a page *at the same time*.[2]

The report conveys a graphic description of the rich, at times grotesque experience of hallucinogen inebriation. While certain neurochemical aspects underlying the intoxication are registered by the positron emission tomographer the test person has to fill in a multitude of questionnaires to document his inner experience. One of the most important instruments for this purpose is the self-rating scale APZ developed by the German psychologist Adolf Dittrich (1985, 1994). Its 94 items serve to quantify three statistically constructed dimensions of altered states of consciousness: 'oceanic boundlessness' (a term borrowed from Freud (1999 [1930]: 421-431)) designates a positively experienced state of self-transcendence, in its most pronounced form the ecstasy of mystical experiences; 'dread of ego-dissolution' serves as a measure of the anxiety that can also be felt when the self appears to be disintegrating; and 'visionary restructuralization' assesses the degree of perceptual alterations and distortions occurring in an altered state of consciousness. These psychometric subscales are meant to define operationally the three axes of the psychedelic experience, which the writer Aldous Huxley (1956) referred to as heaven, hell, and visions.

As the experience of the test subject quoted at the beginning of this section was dominated by hallucinations, I will use the third subscale measuring changes in sense perception to illustrate how the APZ questionnaire works. It comprises items such as: 'I could see images from my memory or imagination with exceeding clarity.' 'I saw regular patterns in complete darkness or with closed eyes.' 'Colors seemed to be altered by sounds or noises.' 'I experienced everything as frighteningly distorted.' The test subject is asked to rate to what extent these first-person statements apply to his particular experience—compared to 'normal waking consciousness'—by marking a scale from 1 ('No, not more than usually') to 10 ('Yes, much more than usually'). Thereby, the profound drug-induced changes in the quality of experience are translated into numbers. Among several self-rating scales, the APZ questionnaire has become the instrument most widely used in Europe to measure altered states of consciousness.

Of course, filling in questionnaires is not the same as writing detailed experience reports. The test person quoted above complains that the given items cannot represent his experience

adequately. It remains unclear against which experiential background subjects evaluate the extraordinariness of their drug experience. And their accounts can only be provided in retrospect. At the time of their occurrence, singular mental events such as the emergence of a hallucination escape objectification. As Vollenweider puts it:

> It's extremely difficult to capture this inner truth or subjective reality. It can be mapped with rating scales and neuropsychological experiments, but these experimental interventions make these states collapse. There is something like Heisenberg's uncertainty principle in hallucinogen research: When you're observing the neurophysiology the experience escapes you and vice versa.

However schematic, the questionnaires filled in after the fact provide a summary of the drug experience that can be related to the averaged out instrumental recordings. Unlike the above-cited free report, which was not included in the researchers' systematic analysis of the study, this standardized and quantitative form of introspection is compatible with the numeric data generated by the PET scanner.

Functional neuroimaging is often misconceived as being primarily about the colorful images, which it produces and which the media have made the hallmark of the neuroscience hype since the Decade of the Brain. However, the alleged 'iconophilia of cognitive neuroscience' (Hagner, 2006: 219) is first and foremost the iconophilia of clinical radiologists (Joyce, 2008: 24-46), science journalists, and popular science writers, but not of neuroscientists. In an article on the iconoclasm of imagers entitled 'Images Are Not the (Only) Truth', Anne Beaulieu (2002: 59-60) points out 'that for researchers, if these pictures are pictures of anything, they are pictures of numbers.' 'The abundance of representations in neuroscientific contexts that overwhelms the neophyte clashes with the conceptions of researchers that they are involved in making measurements of the brain, not obtaining images of it.' (see also Langlitz, 2008)

Methodologically, the point of Vollenweider's first major PET study on the effects of psilocybin (and ketamine) as a model of psychosis was to establish a correlation between numbers: 'To explore the relationship between psilocybin-induced [psychological] reactions and metabolic alterations, the APZ, AMDP, and EPI scores for hallucinatory disturbances, ego, and thought disorders were correlated with the changes of absolute metabolic rates of glucose or metabolic ratios [in different brain areas].' (Vollenweider et al., 1997b: 365). Vollenweider calculated the strength of the relationship between the quantified alteration of consciousness and the drugs' effects on spatially differentiated brain activity with the Spearman correlation coefficient. This statistical method was developed in 1904 from the practice of correlation. Correlations had been invented 15 years before by Francis Galton to examine associations between two variables in domains of natural variation in which it proved difficult to establish clear lines of causation (Porter, 1986: 270-314). The neurobiology of the human mind is such an area. Not only does it appear unlikely that a particular quality of experience is brought about by metabolic changes in one brain region alone, but the very idea of a causal relationship between mind and brain is a subject of heated debate. In a field deeply divided by an ongoing philosophical trench warfare, statistics serve as a common language facilitating exchange between ideologically oppositional parties (Porter, 1992). Correlations can indicate, but they do not require a causal relationship between neural activity and human consciousness. It is this mathematical practice which constitutes what Francis

Crick and Christof Koch (1990) called the 'neural correlates of consciousness'—and its drug-induced alterations.

Vollenweider's correlation of PET measurements and psychometric self-rating scales shows that neuroimaging did not lead to a marginalization of introspection (Hagner, 2006: 193). Historically, self-observation was a key element of the emergent science of experimental psychology in the late nineteenth century. But it was soon sidelined by the triumph of behaviorism (Baars, 2003b; Ziche, 1999). The black box of mental processes was opened again in the second half of the twentieth century when cybernetics was introduced to brain research examining the processes occurring between sensory input and motor output. However, only since the resultant cognitive neurosciences have come to widely employ functional neuroimaging we are witnessing a renaissance of introspection. The investigation of neural correlates of consciousness and subjectively experienced mental events (mystical experiences, anxiety, etc.) requires that test subjects provide first-person accounts of their experiences (Jack & Roepstorff, 2003). Otherwise, it would be impossible to tell what the measured neural correlates were correlates of. After the 'scientific taboo against consciousness' (Baars, 2003b) in the wake of behaviorism, neuroimaging led to a rehabilitation of introspection as the royal road to conscious experience. Hence, the test subjects' subjectivity is heavily implicated in the functional images. The reconfiguration of our understanding of mind and brain brought about by the cognitive neurosciences amounts to no mere biologization of mental life, but also to a 'mentalization' of the brain.

SET, SETTING, AND THE SCIENTIST'S SUBJECTIVITY

In Switzerland, the revival of hallucinogen research in the 1990s also involved a laboratory in Berne run by Rudolf Brenneisen, a professor of pharmaceutical sciences. During my fieldwork, I conducted an interview with Brenneisen (RB) and Paul J. Dietschy (PJD), the administrator from the Swiss Federal Office of Public Health who was responsible for research with controlled substances at the time. The conversation revealed a telling conflict between the scientist and the administrator pointing to the problematization of researchers' personal familiarity with the drugs they study.

RB: When my doctoral student Felix Hasler elucidated the metabolism of psilocybin in humans in the mid 90s we served as test subjects ourselves. I was one of them. At the time, I was an official consultant of the Swiss Federal Office of Public Health. That provoked a nice little conflict: A consultant of the SFOPH volunteers for a psychotropic experiment! The ethics committee required that neither medical students nor people from the street took part in this trial. It had to be people who knew what to expect and who had been screened extremely well by Vollenweider and his colleagues. If someone's grandmother had a psychiatric problem they were out.

PJD: I can add that when I heard about this I thought that it wasn't a good idea at all.

RB: That was the conflict we had.

PJD: We sat down together and I realized that this was a requirement of the ethics committee. Then we agreed that it made sense to conduct this study at a relatively high security level instead of taking anyone, maybe even paid test subjects or medical students who might end

up enjoying it. We wanted test subjects who were knowledgeable and who also knew the risk they were taking. So I waved this through. But you are right, we fought with each other quite passionately.

NL: Where did your original reservations come from?

PJD: Brenneisen was in charge of the study. I said: In my eyes, the study director has to be independent. But that's hardly possible if he takes the substance himself.

Dietschy's concern about Brenneisen serving as a test subject in a study that he supervised cannot simply be attributed to his role as a regulator defining the external conditions of scientific activities (including those in Vollenweider's laboratory) without being involved in the actual research himself. What he evokes is an ideal that emerged within science, namely objectivity.

Lorraine Daston and Peter Galison (2007) have shown how objectivity arose as an epistemic virtue in the mid-nineteenth century. It was preceded by the prevalence of 'truth-to-nature', an attitude toward the objects of science aiming at extraction of the typical. Truth-to-nature required scientists sufficiently experienced to tell the essential from the accidental. At about the same time, in the eighteenth and early nineteenth century, the scientist's self was also asserted confidently in the practice of self-experimentation. Experimenting upon oneself was not only regarded as respectable, but distinguished a scientist as a superior source of knowledge. In a competitive field, both the self-experimenter's heroism and the fact that he had experienced certain phenomena first-hand with which his colleagues were personally unfamiliar served as sources of social distinction (Oreskes, 1996; Strickland, 1998).

With the emergence of objectivity, this view changed radically. Objectivity called for the effacement of the scientific self. This new scientific norm favored mechanical recordings to capture nature with as little human intervention as possible. Self-experimentation became suspect as its results were now regarded as prone to distortion by the scientist's will. Objectivity was born out of a deep-seated distrust, even fear, of the subjective and its inclination to defile an impartial perspective on the world (Daston & Galison, 2007: 49, 191-251). In the case of hallucinogen research in particular, the ardor with which a few vocal individuals from the previous generation of researchers working in this field had come to advocate drug use had raised grave concerns whether drug experiences did not corrupt the dispassionate outlook expected from scientists.

But the question is not only whether drug experiences distort the researchers' scientificity, but also whether this scientificity distorts the researchers' experiences. When investigating psychedelics, the bias inherent to studies examining a select population of pharmacologists and psychiatrists (which is common practice in Germany, where, for ethical reasons, only medical professionals can serve as test subjects in hallucinogen experiments) might be particularly pronounced. For hallucinogen effects were found to be highly dependent on a subject's personality, mood, and expectations as well as on his or her social and physical environment. The Harvard psychology professor and aspiring drug guru Timothy Leary (1963) coined the catchy terms 'set' and 'setting' for these non-pharmacological factors shaping the drug experience. As both a social constructivist invested in human engineering and an ardent drug mystic all too familiar with the spiritual ecstasies described by the test subject in the opening paragraph of this article, Leary (1964: 11) claimed: 'Of course, the drug does not produce the transcendent experience. It merely acts as a chemical key—it opens the mind, frees the nervous system of its ordinary patterns and

structures. The nature of the experience depends almost entirely on set and setting'.

However, Leary was not the first to describe the context-dependence of hallucinogen action. When the phenomenon was originally noted by the anthropologist Anthony Wallace (1959) he expressed his conviction that the effects of other drugs such as tranquilizers, sedatives, and energizers also in part depended on mind-set and milieu. However, hallucinogens soon acquired a special status in this discussion: Not only were their effects found to be influenced by an individual subject's mental state and surroundings, but they were said to pharmacologically amplify the impact of these non-pharmacological factors on human experience. With respect to lysergic acid diethylamide (LSD), a close relative of psilocybin, the psychiatrist Lester Grinspoon and his colleague James Bakalar (1979: 90) noted: 'In experiments, most drugs make all subjects feel more alike; LSD actually tends to accentuate any difference in mood that exists among subjects at the start'. This assumption continues to be made by hallucinogen researchers until this day (see, for example, Sessa, 2008: 826).

Among a group of people professionally dealing with these substances, the subjects' mind-sets are likely to be more uniform or at least more developed. Furthermore, a self-experimenting scientist's expectations concerning the outcome of her self-experiment might affect its results, especially if the test subject's experience is the focus of attention. If the researcher's initial hypothesis and professional desires inflect her findings her subjectivity undermines the scientific pursuit of objective knowledge.

Dietschy's defense of objectivity against Brenneisen's participation in the experiments of his doctoral student Felix Hasler was first and foremost a matter of principle. He might also have been worried about possible future studies focusing on the psychological effects of psilocybin (which Hasler, after the completion of his dissertation, came to conduct in Vollenweider's laboratory). But the study Dietschy and Brenneisen fought over investigated the drug's pharmacokinetics, i.e., its metabolization by liver and kidneys. A distortion of the results by a subjective bias was not to be expected. However, the positive reasons both Brenneisen and Dietschy provided for why Brenneisen eventually took part in the experiment were ethical invoking the heroic ethos of self-experimentation. Instead of 'people from the street' or medical students who might get turned on to drugs, the mature, strong-minded, and self-sacrificing man of science was to go first (Altman, 1987; Oreskes, 1996). This outcome is presented as an acceptable compromise between ethics and epistemology as two antagonistic modes of reasoning.

PERSONAL KNOWLEDGE IN PSYCHOPHARMACOLOGY

In the experimental practice of the Vollenweider lab, the relationship between ethics and epistemology appears to be more complex though. In fact, they are inextricably entwined. At the time of my fieldwork, Patrick, an advanced doctoral researcher, and Anna, a biology student, are developing a study on psilocybin to produce data for Anna's graduation thesis.[3] Although the consumption of hallucinogenic funghi containing psilocybin is no uncommon pastime among Swiss youth it turns out that she has never taken any 'magic mushrooms'. In a discussion of her research project over lunch, another Ph.D. student suggests that she should try psilocybin herself before administering the drug to test subjects. The underlying argument is spelled out by his more senior

colleague Felix Hasler (2007: 40 [my translation—NL]):

> In the debate [over self-experimentation], there are two classical positions. Some people say that one shouldn't do self-experiments because this jeopardizes scientific objectivity. I don't agree with that. If I do hallucinogen research, I should know the effects of these substances first-hand. Besides, there is an ethical responsibility. If I expect my test subjects to put up with certain states I should at least know from personal experience what they're going through.

For LSD, the recommendation that psychiatrists should first test the substance on themselves was already issued in the late 1940s by the Swiss manufacturer Sandoz (Grob, 2002: 17). Most hallucinogen researchers continue to subscribe to this view until this day and Anna soon comes to adopt it.

Before long, Anna and Patrick set up a pilot study. They take turns in serving as subjects in a trial version of their experiment. Her test run is smooth: some nausea at the beginning, colorful geometric patterns with eyes closed, mild hallucinations with eyes open, inhibited and persevering thought processes, but neither emotional turmoil nor any quasi-psychotic episodes. The unpleasant surprise comes when her more experienced coworker is to take the drug. Serving as a test subject in one of his colleague's experiments, Patrick already ingested psilocybin twice without encountering any difficulties. But this time, it is different. The experiment involves an EEG measurement during which the subject is shown a series of images presented on a computer screen. Even though these pictures are supposed to be affectively neutral, they make Patrick feel anxious. Eventually, he asks for the measurement to take place without the images. But deprived of this focal point of attention, things get even worse. All of a sudden, the small EEG chamber becomes bigger and bigger while Patrick feels like a midget. A sense of profound solitude creeps up —as if he were the only human being in the whole universe. He begins to worry that his negative affects might interfere with the measurement. Eventually, he wants to break off the experiment, but this makes him all the more terrified: Doesn't it prove that he is in big trouble by now? Subscribing to the model psychosis paradigm Patrick conceives of his condition as gradually lapsing into a schizophrenia-like state. The situation is further complicated by the role reversal between Patrick as the one leading the study and Anna who now has to take care of him with nobody else directing her anymore. He later on remembers:

> I tried to stay in charge supervising how Anna was looking after me, checking how I was affected by the stimuli, whether the room would be bearable for the subjects, etc. I tried to evaluate all of this. The problem was that I wanted to keep everything under control, which is simply impossible on psilocybin. That made me fully aware of the fact that I was losing control. So I got all worked up about this. You need to let go.

When Patrick also starts to feel dizzy and nauseous, Anna decides to call Vollenweider for help. With an authority and sensibility based on personal familiarity with the drug as well as with the whole spectrum of responses of a large number of experimental subjects, Vollenweider quickly manages to calm Patrick down enabling him to finish the trial. In the wake of this incident, Patrick and Anna redecorate the EEG chamber to make it look friendlier. They also replace the computer images which Patrick perceived as frightening by pictures of a more positive emotional tone hoping to spare their test subjects such 'bad trips'. Thereby, the researchers acknowledge that the drug

effects cannot be reduced to pharmacological properties of the ingested substance, but are molded by the setting.

At first glance, again the scientists' personal experiences seem primarily implicated in the ethical dimension of their work—although in a different way than in Brenneisen's case. The Vollenweider lab does recruit 'people from the street', mostly students eager to experience a hallucinogen trip in a supposedly safe setting or interested in earning some extra money by serving as test subjects in a clinical trial (a common procedure in pharmaceutical studies, which Brenneisen and Dietschy only regarded as problematic because psilocybin is conceived of as a drug of abuse). Whereas the measurement of Brenneisen's pharmakokinetics contributed to Hasler's findings, a pilot study like the one run by Patrick and Anna does not serve to generate publishable data. The scientists do not experiment upon themselves to replace other test persons, but to try out the methods, instruments, and drugs before a study with externally recruited subjects is launched. In such test runs, they familiarize themselves with the equipment and procedures and gain a better understanding of how their future test subjects might experience the situation. The goal, to treat them well and to make the situation as comfortable as possible for the participants, is an ethical one. But it is also key to the scientific ends of the experiment. If subjects are too troubled to focus on their tasks or if they even drop out of the trial no knowledge will be produced. Here, care and method, ethics and epistemology intermingle.

Often, pilot studies also serve as soundings to formulate a hypothesis or to check whether an envisaged experiment has sufficient potential. The results of such self-experimental pilot studies are usually not published. Today, no respectable scientific journal would accept a study based on systematic self-experimentation. Instead one tries to reproduce and consolidate the findings from the pilot study with test subjects recruited outside of the laboratory.

After completion of the actual study, personal drug experiences acquired in pilot studies or in private help the researchers to interpret or weigh the significance of their data. For example, what might appear to be a hallucinogen-induced attention deficit could also reflect a lack of interest, which a tripping test subject experiences when having to perform test after test on a computer screen while confronted with the most elementary questions of life or a magical world of sublime beauty. As a British colleague of Vollenweider's puts it graphically:

> It is well accepted that when under the acute influence of psychedelic drugs, performance on standard tests of intelligence, learning, memory and other cognitive functions, as well as certain psychomotor tasks, generally show impairment and sometimes show lack of change and only rarely show improvement (Carter et al., 2005). However, it is often difficult to get meaningful data from such measurements because subjects frequently become engrossed in the subjective aspects of the drug experience and lose interest in the tasks presented by the investigators. Psychological tests are often seen as absurd or irrelevant by the subjects, illustrated well by this quote from the psychologist Arthur Kleps (1967), 'If I were to give you an IQ test and during the administration one of the walls of the room opened up, giving you a vision of the blazing glories of the central galactic suns, and at the same time your childhood began to unreel before your inner eye like a three-dimension colour movie, you too would not do well on an intelligence test'. (Sessa, 2008: 826)

As test subjects of pilot studies, most hallucinogen researchers have experienced such situations

firsthand and are careful not to rush to drug-naïve conclusions.

These manifold implications of the subjective in scientific practice are indeed incompatible with the ideal of objectivity. But, as Daston and Galison (2007) have shown, there are more—and sometimes conflicting—epistemic virtues at work in science than this historically rather recent norm. Researchers' participation in pilot studies is not regarded as compromising the scientificity of psychopharmacology, but as a way of acquiring a kind of practical wisdom. From their fleeting drug experiences the scientists emerge as experienced subjects. Through subsequent reflection temporary alterations of consciousness give rise to and are integrated into more sophisticated forms of scientific subjectivity. Firsthand knowledge of what it feels like to be under the influence of a particular drug enables researchers to develop the kind of empathy necessary to attend to their test subjects. Apart from such social skills it also provides an experiential orientation that helps interpreting and evaluating experimental results. Different forms of such skillful knowing and doing have always played a pivotal role in scientific practice, but were hardly acknowledged and, if possible, practically marginalized, under the reign of objectivity.

However, by the time Michael Polanyi (1958) put his finger on the importance of 'personal knowledge' in the sciences objectivity had already been structurally relocated (not replaced) by a new epistemic virtue, which Daston and Galison call 'trained judgment', reinstating the scientist's subjectivity. Trained judgment calls for the development of personal knowledge based on familiarity and experience that allows to intuitively make sense of variation in empirical findings without returning to the ideal-typical representations of truth-to-nature. Despite this revaluation of the subjective and the plurality of norms guiding scientific practice, objectivity continues to maintain such a powerful position that, in public, it is almost equated with scientificity. Of course, researchers are well aware of the value of experience. In the lab, they frequently talk about it. And, even though this is rather taken as a psychopharmacological virtue than a categorical imperative, they encourage the novices to familiarize themselves with the drugs they are studying.

Nevertheless, from their publications the role of personal knowledge is systematically excluded. Here, the mechanical measurements and the procedural logic of method characterizing objectivity continue to prevail. The subjective is still highly vulnerable to criticism in a field that is divided by particularist interests while striving for universal knowledge.

THE HALLUCINOGEN EXPERIENCE AS A HUMAN KIND

The interplay between personal drug experiences and psychopharmacological knowledge is bound to affect the self-conceptions of the scientists involved. In an interview, pharmacologist Hasler (2007: 39 [my translation—NL]) explains:

> From experiments with hallucinogens I learnt how manipulable the psyche is, how fundamentally our whole being and experience depends on our brain chemistry. Smallest amounts of a chemical substance lead to a total restructuralization of the whole of consciousness—seeing, feeling, thinking, space, time, ego, environment—everything gets mixed up.

When such powerful neuropharmacological interventions shatter everyday consciousness the identity of the mind and the brain presupposed by many neuroscientists seems to be transformed

from an abstract philosophical postulate to an immediate experience. Thereby, hallucinogens have taught Hasler and many of his colleagues to conceive of themselves as 'neuochemical selves' (Rose, 2003).

However, it is not hallucinogenic neurochemistry alone, which brings about this identification of brain and person. When Peruvian or Siberian shamans ingest a plant hallucinogen or an inebriating toadstool they are not not struck by the fundamental dependency of their whole being on brain chemistry, but communicate with the spirits of their ancestors (Furst, 1976). Their visions are informed by different self-images and worldviews. In this respect, anthropologist Marlene Dobkin de Rios (1975: 402-407) speaks of the 'cultural patterning of hallucinatory experience', which also takes place in the laboratory. Thus the researchers' hallucinogen experiences have been mediated by their psychopharmacological knowledge and feed back into the generation of this knowledge.

This looping effect makes the hallucinogen experience a human kind in Ian Hacking's (1995) sense. In contrast to natural kinds, human kinds are transformed by their descriptions. New ways of talking about drug experiences certainly leave the drugs unchanged, but not the experiences, which they elicit in self-conscious human beings. There is little doubt that Hasler's neurologized hallucinogen experience is strikingly different from the spirit quest of an Amazonian medicine man. It is the experience of a 'cerebral subject' as it has emerged in Euro-American science and philosophy since the eighteenth century (Vidal, 2005, 2009).

Hacking attributes the investigation of human kinds to the human sciences. According to Foucault (1973), these sciences of 'man' emerged at the turn from the eighteenth to the nineteenth century alongside modern linguistics, economics, and biology as empirical bodies of knowledge constituting man as a speaking, working, and living being. In this new discursive formation, language, labor, and life not only appeared as objects of empirical inquiry, but also as the quasi-transcendental conditions of any such inquiry. 'Quasi-transcendental' for what makes up our humanness is also transformed and thereby historicized by human activity. For example, it is as living beings that biologists study life. Whatever they find out about their objects of study is bound to affect their self-conceptions as subjects of inquiry. The historically and culturally contingent epistemic figure of man, Foucault (1973: 318) argues, is simultaneously subject and object of his own understanding: 'Man […] is a strange empirico-transcendental doublet, since he is a being such that knowledge will be attained in him of what renders all knowledge possible'. Consequently, this epistemological configuration has been haunted by a structural instability from the start:

> [M]an became that upon the basis of which all knowledge could be constituted as immediate and non-problematized evidence; he became, *a fortiori,* that which justified the calling into question of all knowledge of man. Hence that double and inevitable contestation: that which lies at the root of the perpetual controversy between the sciences of man and the sciences proper. (Foucault, 1973: 344)

Where the neurosciences reflexively examine and naturalize their own epistemological preconditions they enter into the precarious space of the empirico-transcendental double. In a public lecture, Hasler articulated this concern as follows: 'Can we investigate the neural basis of different states of consciousness? For this purpose, hallucinogens suggest themselves. However, here the observer and the observed are situated on the same ontological level. This raises the big

question: Can a brain study the brain, can consciousness understand consciousness? Can man know himself?' (see also Singer, 2002: 61-62)

This naturalist reflexivity does not keep the neurosciences from treating the brain, consciousness, and humans as natural kinds. When reflecting on the cognitive limits posed by the scientist's 'mind–brain' to understanding the 'mind–brain', the resulting insights are not taken to feed back into the research process. In fact, it is an essential part of the construction of the mind–brain as a scientific object to prevent such looping effects. In neuropsychopharmacology, this goal is pursued by way of the standard approach of placebo-controlled trials. The psychophysiological effect of a drug is established by subtracting from it the effect of a pharmacologically inactive substance. Thereby, the drug effect can be attributed solely to the drug—while its possible molding by set and setting are rendered invisible. What distinguishes the neurosciences from the human sciences is that reflexive concerns about the empirico-transcendental structure of the epistemological figure of man are not translated into scientific *practices* of reflexivity (Smith, 2005).

Nevertheless, psychopharmacology—or 'pharmacopsychology', as Kraepelin still called it in the late nineteenth century (Müller et al., 2006)—is no pure natural science. Significant parts of the discipline are located at the intersection of the natural and the human sciences. Investigations of hallucinogen-induced alterations of consciousness are a striking example. If the psychedelic experience is affected by the subject's self-conception and understanding of the experiment it must be considered a human kind—even though the methodological armamentarium of psychopharmacology fails to provide the tools necessary to study it as such. Does this failure reflect a fundamental epistemological limit of psychopharmacology or a contingent fact about the history of the discipline?

In 1959, Anthony Wallace, an anthropologist specialized in Native American cultures and Director of Clinical Research at the Eastern Pennsylvania Psychiatric Institute, noted marked differences in experience reports provided by experimental subjects who had been administered the hallucinogen mescaline in the laboratory and members of indigenous peoples eating mescaline containing peyote cacti. Wallace (1959: 80) attributed these differences to two 'cultural determinants': 'first, the influence of the setting in which the drug is taken (the white subject's experiences occur usually in a hospital or university research setting; the Indian experiences, in a ceremonial lodge during a solemn religious ritual); and, second, differences in the psychological meaning of the primary drug effects when experienced'. In response to this finding, Wallace suggested that the emergent approach of placebo-controlled trials be supplemented by the 'method of cultural and situational controls'. The idea was to hold the drug constant while varying physical experimental conditions and instructions to subjects and personnel. He also proposed to select test persons systematically on criteria of personality, past experience, attitude toward the expected events, and cultural background. But, whereas placebo-controlled trials soon came to be seen as the gold standard of pharmaceutical research, culture controls never really caught on in psychopharmacology (DeGrandpre, 2006). In the history of cultural anthropology, it is the positivist conception of culture underlying Wallace's suggestion which has long been left behind. But, for psychopharmacology to do justice to drug experiences as human kinds, Wallace's work might be worth revisiting while keeping in mind that both pharmaceutical science and cultural anthropology have since moved on.

CONCLUSION

This ethnographic case study of hallucinogen research has shown how the subjectivity of both test subjects and scientists persists in contemporary psychopharmacology despite its objectivist facade. The assumption shared by most hallucinogen researchers that hallucinogenic drug action cannot be explained in pharmacological terms alone, but also depends on set and setting makes the psychedelic experience a human kind. As such its investigation would have to be supplemented by approaches derived from human sciences such as anthropology. What contemporary forms such an inquiry could take would have to be determined by way of thoughtful 'experiments in interdisciplinarity' in the borderland of the human and the natural sciences.

As a case study, the conclusions to be drawn from the observations presented in this article cannot simply be generalized. Nor are they necessarily restricted to the particular case of contemporary hallucinogen research. For the anthropology of science, the significance of this assemblage of dominant and marginal practices does not lie in its particularity or universality, but can only be assessed in the future by way of casuistic juxtaposition to similar paradigm examples from neuroscience and psychopharmacology laboratories (Rabinow, 2003: 130-133). How is the test subjects' and scientists' subjectivity dealt with elsewhere? What role do set and setting play in the scientific practices of other subfields of psychopharmacology? And, when shifting from ethnography to the kind of anthropologized pharmacopsychology envisaged above, the significance of the case of hallucinogen research also depends on the following two questions: How strongly and in what ways exactly do the 'cultural determinants' of set and setting mold the effects of hallucinogens on the human mind? And is the impact of these non-pharmacological factors on drug action restricted to hallucinogens or does it concern all psychoactive agents as Wallace (1959: 84) suggested? If Wallace turned out to be correct, not just hallucinogen research, but the whole of psychopharmacology would require a rapprochement with the human sciences.

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NOTES

[1] To protect the privacy of the test subject the name has been changed.

[2] Citation by courtesy of the principal investigators Boris Quednow and Felix Hasler (my translation—NL).

[3] Following ethnographic convention, I am using pseudonyms to protect the identity of these two informants.