Chapter 8
The Ambivalence of Visible Scientists

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8.1 Introduction

In 1953, James D. Watson and Francis Crick discovered the double helix structure of the salt of deoxyribose nucleic acid (DNA). Fifteen years and a Nobel Prize for this research later, the general public discovered the "truth" about scientists in Watson's popular book *The Double Helix*: "they can be boastful, jealous, garrulous, violent, stupid" commented the St. Louis Post-Dispatch (as quoted in Merton 1973: 325). The sociologist of science Robert K. Merton saw the media debate, and even more the outrage amongst scientists, as revealing of the fact that scientific behaviour is governed by a certain ethos.[1] The relevance of social norms that any scientist takes in just as he acquires technical skills was put forward in a seminal paper for the sociology of science (Merton [1942] 1973: 268f). It is only if we *expect* scientists to behave universalistic, disinterested and solely geared towards common scientific progress that we can be disappointed to read the first sentence of the book "I have never seen Francis Crick in a modest mood" (Watson [1968] 2001: 7); or to hear Watson's reflection on his professional prospects: "It was certainly better to imagine myself becoming famous than maturing into a stifled academic who never risked a thought" (ibid.: 35). Outrage directed towards contraventions of the norms – namely universalism, communism, disinterestedness and organised scepticism – is but one demonstration of their structural importance. That scientific practice is governed by a normative structure is furthermore apparent in the occurrence of contradictions between different norms. Studying priority struggles in the history of science, Merton found a widespread ambivalence towards priority issues that he explained by conflicting normative expectations (1976). On the one hand, the value placed on the

[1] For reviews on the reception of the book in science and in the media, see Stent (1968) and Yoxen (1985).

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originality of scientific contributions demands the pursuit of knowledge production. This includes seeking and getting credit for the priority of discovery. On the other hand, the institution supports the ideal of the intrinsically motivated researcher who is driven by curiosity, not by a quest for recognition. Merton concludes that the juxtaposition of the reward system and the normative structure results in ambivalence in which "scientists are contemptuous of the very attitudes which they have acquired from the institutions to which they subscribe" (Merton 1973: 285). This "ambivalence of scientists" is structurally induced; it is a conflict that can be attributed to a social role, not to an individual role occupant (see Merton and Barber 1976: 6ff).[2]

Whether the Mertonian ethos is an appropriate description of science has since been called into question. The norms have been critically reassessed as "vocabularies" for ideological constructions of science (Mulkay 1976: 646; Gieryn 1983), and a review of the field states "a widespread sense in science studies that the Mertonian paradigm has been vanquished and relegated to the museum if not the attic of science studies" (Restivo 1995: 97). Other reviews, in contrast, leave no doubt that scientific practice is governed by social norms as well as by technical standards and emphasise that the "ethos of science" is a valuable description thereof (Stehr 1978: 184ff; likewise Weingart 2001: esp. 68ff). Weingart understands the ethos as an analytic subsumption of the social organisation of science which allows distinguishing short-term surface phenomena from fundamental change (Weingart 2001: 86). Transformations in the normative structure of science are thus indicative of changes in the relationship of science and other social systems such as politics and the mass media.[3] To draw on the Mertonian description thus has its merits in particular for analyses of those conflicts in the relationship of science and its environment which seem to be rooted in normative expectations of scientific and other institutions that directly contradict one another (ibid.: 75).

This paper argues that there is scope for such conflicts in the context of what has been called "medialization of science". The medialization concept postulates a tendency to orient science towards the interests of the media because their attention for issues, scientists, research institutes and scientific journals is perceived as crucial for public support (see Chapter 1). To investigate the relevance of media attention and demands for the professional role of scientists as one aspect of medialization is the intention of this chapter. To tackle the science-media interface at the individual level yields two complementary research questions: How do scientists perceive

[2] This sets the sociological concept of ambivalence apart from its use in psychology where it refers to ambivalent feelings of an individual. A psychological ambivalence, however, may be rooted in a structurally induced conflict. A role occupant's mixed feelings can thus be revealing of a tension built into a particular social role (for an example, see Section 8.4.1).

[3] Merton himself develops his analysis with regard to influences of the political system on science in the 1930s.

themselves as visible scientists[4]? And how does the peer community evaluate the media presence of an individual scientist?

In the following, expectations linked to the social status of the scientist are discussed in detail, and the concept of *boundary role* is proposed to describe the role of the visible scientist (Section 8.2). This allows complementing the analysis of individual role preferences with the question of how the role performance of a visible scientist is integrated into the scientific community. For the high profile field of human genome research (Section 8.3) it will be shown that scientists react to expectations to be visible. For the visible scientist as well as for her colleagues, this induces ambivalence that is grounded in conflicting expectations (Section 8.4). The genome case provides evidence for a role ambiguity of visible scientists and furthermore suggests that the view that visibility is now firmly built into the role expectations of scientists is policy talk rather than empirical fact (Section 8.5).

8.2 "Shun the Limelight" or "Thou Shalt Communicate"?

As its point of departure, this paper understands science as a social system in its own right. The production of knowledge evolved into what is now modern science when the question of the reliability of scientific knowledge was disconnected from its accordance with religious beliefs, its political correctness or its news value.[5] The therewith established cognitive and social imperatives distinguish science from other spheres such as the political system or the mass media as the arena of public communication. Scientists, on the contrary, closed their communication by using technical jargon and developed the scientific community as their primary audience. It is for this reason that science differs in its relation to its publics from most of the major social spheres in our society. Other than the political or the law system, where everybody is eligible to vote or endued with rights enforceable by law, science is not socially inclusive (see Stichweh 2005).

> Ordinary people may readily observe carpenters, lawyers, or nurses at work; but even in a technologically advanced country such as the United States, few people ever watch scientists working in any stage of the research process (LaFollette 1990: 18).

[4] The term "visible scientist" was introduced by Rae Goodell (1977). In this paper, the analytical concept of visibility as public communication, i.e., communication with audiences other than the scientific community, is operationalised as visibility in the mass media, in line with the argument that these media form an important resource for the public legitimacy of science in modern democracies (see Chapter 1). The role of the visible scientist thus encompasses intellectuals and media experts. This distinction is not relevant for my concern; it would be, however, if one wanted to compare the media visibility of life scientists with that of social scientists, for instance.

[5] "If you nowadays try to hold against biologists that one of their discoveries is politically right or left, catholic or not catholic, you will provoke open exhilaration, but this has not always been the case" (Bourdieu 1998: 20, my translation). It is obvious that scientific disciplines differ in the degree of exhilaration when facing such allegations.

Science is not genuinely a "visible" occupation and it is for this reason that the scientific community has been found to be "as uncomfortable about the democratization of science communication as the rest of us are about some of the other effects of technology" (Goodell 1977: 8). Describing the attitudes of the scientific community towards visible scientists, Goodell concludes from qualitative interviews conducted in 1977 that scientists lose their colleagues' respect if they voluntarily seek or accept media prominence (ibid.: 90ff.). There is furthermore ample anecdotal evidence that scientists frown on colleagues on magazine covers, but so far the issue has not been examined from the perspective of the sociology of science. If a scientist's primary audience is the scientific community, public communication is to shun because it disregards the audience of the peers and thus jeopardises the quality control that scientific knowledge owes its reliability to. The norm of the community protects the peer's communication system and reads: "*Shun the limelight*!" In line with that norm, the traditional relationship of scientists and journalists has been characterised by misunderstandings and tensions: "The tension tends to decrease communication between the two groups, which decreases the quality of science news, which in turn increases the tension" (Goodell 1977: 132).

These tensions have long been noticed and viewed as a problem with regard to science communication efforts (e.g., Chapter 13). There is a vast interest of science policymakers in communication activities that complements the self-interest of the media in science news to be used (see Chapter 1). With regard to our concern here, the role of scientists in this process, it is worth mentioning that policy statements and reports address the scientific community as their primary audience: "Our most direct and urgent message must be to the scientists themselves: Learn to communicate with the public, be willing to do so and consider it your duty to do so" (The Royal Society 1985: 36). Criticised is above all the lack of respective modules in the training to be a scientist; junior researchers are typically identified as the first target group for the teaching of media skills. In the form of "Criterion 2 – broader impacts", outreach duties are part of the funding policy guidelines of the world's largest funding agency, the US National Science Foundation. Alongside research and teaching, dissemination is anchored as the "third task" of scientists in university acts, for instance, in Denmark (Act on Universities 2003; for a related survey of Danish scientists, see Nielsen et al. 2007). German science policy goes as far as to postulate that engagement in outreach activities should be eligible for reputation (Stifterverband für die Deutsche Wissenschaft 1999: 60; Streier 2006). Academic institutions consider their organisational visibility as a prerequisite to be competitive for funds and students. All over the world, they include the participation in communication activities as a professional duty (see for Germany, Peters et al. 2008; for Norway, Kyvik 2005; for France, de Cheveigné 1997). The expectations have been found to be formally integrated especially in organisational leadership roles (Peters et al. 2008). It is a feasible option to entrust a few organisational leaders with "representation" duties of public communication but the mainstream view on science communication policy reads differently: Every scientist is requested to actively participate in the visibility of science by engaging in communication with

its diverse publics. That science operates in a society where it is unavoidably linked to the political, economic and media system implies that scientists have the choice to address diverse publics that dispose of resources such as funding, prominence or prestige. In line with the science policy goals and demands from funding agencies and research organisations, recent studies state that scientists "are at the very least aware of a push toward public communication" (Davies 2008: 414). In editorials and science policy pieces, science policymakers and scientists themselves express the need to engage every scientist:

> It would be convenient to leave this task in the hands of a few representatives selected especially for their communication skills, but that won't work. Given the breadth of issues and the intensity of the effort required, we need as many ambassadors as we can muster (Leshner 2007: 161).

Obviously, this is wishful talk. But one does not need to share the policy assumptions to ask sociologically whether there are any implications of what is now broadly considered as a "new commandment": "*Thou shalt communicate!*" (Gregory and Miller 1998: 1, original emphasis). What does this imply for the personal role preferences of a scientist and how visible scientists are seen by their colleagues? Before this question can be empirically addressed, we need to look at the professional role of the scientist in more theoretical detail.

A professional role such as scientist is characterised by a bundle of associated roles, or a role-set (Merton 1957). Traditionally, the role-set of a major category of scientists, academics, is seen to be composed mainly of three different roles: research, teaching and academic self-administration (see Stichweh 1984: 70ff; Klima 1969; and for a normative conception that focuses on organisations, Kalleberg 2000).[6] Other than research, teaching and administration are not vital elements of knowledge production but role expectations towards scientists as professors or as staff members of scientific organisations. These roles thus refer to interrelations of science and other social systems, such as the educational system in the case of teaching or to an organisation in the case of academic self-administration. To study such interfaces, one can speak of "boundary-spanning activities" (Thompson 1967) or "boundary roles", occupied by "boundary role persons" (Adams 1976). The boundary role concept focuses on the individual who provides the linking mechanism across organisational or other system boundaries and addresses the internal and external set of expectations that a boundary role person is exposed to in the course of boundary activities[7] (see Tacke 1997). It brings to attention how boundary spanning activities are integrated into the original system (Luhmann 1999 [1964]: 220ff). In organisations, boundary spanning

[6] For my interest in individual role preferences the focus on the academic role-set is promising because their role-bundle includes teaching and self-administration and is thus inherently more complex than that of a scientist who researches in a private firm.

[7] With regard to science, the concept of "boundary work" has been mainly used as a critique of the "professional ideologies of scientists" (Gieryn 1983, 1999).

units ("Grenzstellen" in Luhmann's terminology) are formalised to deal with a defined part of the environment. Examples are university PR offices to handle media requests or human resources to minister staff membership in an organisation.[8] Boundary spanning units can be thought of as contact points; they have privileged access to the environment, and vice versa: it facilitates a journalist's job if a university clearly indicates who is responsible for media contacts. The functioning of boundary spanning activities can be illustrated using the example of the human eye. Visual information reaches the brain by way of the eyes only, which allows for a focused, unrivalled processing in the brain. Boundary spanning units thus function as channels: they canalise a particular type of information from the environment and relieve the strain of dealing with that environment from the rest of the system. Because the PR office observes the media by way of clippings of the coverage on the respective institution and because it handles media requests, the remaining employees normally do not need to wrack their brains with the university's presentation in the local press. The establishment of boundary spanning units is thus efficient in dealing proactively and reactively with external expectations and constraints and allows the organisation or any other social system to be aware of relevant changes in its environment (Luhmann 1999 [1964]: 224). Interfaces with important environments such as the media are institutionalised on the organisational level, but they also occur in the form of face-to-face interaction: a scientist is interviewed by a science journalist. The interview situation interface develops as a social system in its own right. This implies that boundary spanning activities are characterised by a split loyalty, because a boundary role person is simultaneously integrated in the original social system and in the boundary system. In the interview example, the scientist acts as a member of a scientific community and as a part of a face-to-face interaction. Split loyalty typically results in adaptations to the communication at the interface. In the course of a journalistic interview, a scientist is much more likely to communicate without using jargon than in a discussion with her peers, i.e., a communication internal to the science system. At the interface, these adaptations enhance the chance of mutual understanding and are thus both functional and legitimate; split loyalty allows mobilising problem solutions that would otherwise not be available (ibid.: 228). But the question arises in how far the public presentation of science can be separated from its production without disintegrating the science system.

To complement the analysis of individual role behaviour with a perspective that focuses on the consequences of visibility for the scientific community, I propose to conceptualise visible scientists as occupants of a boundary role at the science-media-interface – just as the institutionalisation of science PR is the formalisation of this interface at the organisational level. The claim that will be developed in this paper is that it is not possible to establish the role of the visible scientist without

[8] The use of the concept has so far been confined to organisational boundary activities (see Luhmann 1999 [1964]; Tacke 1997). Parsons (1955: 11f) was the first to analyse the role of the husband-father as the paradigm of a boundary role outside an organisational context.

introducing a systematic tension to other role expectations in the role-set of scientists. One can therefore assume that the average scientist's role performance is not very much influenced by the mass media. But given that some individuals choose to act as visible scientists, i.e., in the boundary role, leads to the question how this role behaviour is integrated into the science system. The boundary role concept assumes that its in-built split loyalty is noticed within the internal system and leads to tolerance for boundary activities (see Luhmann 1999 [1964]: 228). How much tolerance can a visible scientist expect in the peer community? And does the tolerance increase in times of medialization? To answer these questions requires investigating a case that is characterised by a high public profile. Such a case is human genome research, a field that in the course of the last decade has been repeatedly exposed to high media attention.

8.3 Material and Methods

The human genome project (HGP) was the first "big science" project in the history of biology (Hilgartner 1995). Starting in 1990, an international consortium mapped, sequenced and functionally analysed a reference sequence of the human genome and made the data available to the scientific community free of charge. In May 1998, however, the launch of the private firm Celera Genomics was announced whose goal was to sequence the human genome as a money-making venture. Triggered by the competition between publicly and privately funded scientists to finish draft versions of the genome sequence, the field became highly visible, as witnessed by the staging of media events and the regular appearance of prominent scientists in the press (Nerlich et al. 2002; Gerhards and Schäfer 2009; Rödder 2009a). To assess the consequences of this visibility, the author conducted 55 in-depth interviews with researchers from the publicly and privately funded human genome projects in France (6), Germany (17), the United Kingdom (14) and the United States of America (18).[9] The visible high-profile heads of the projects as well as junior and senior researchers without media experience were interviewed. The scientists' positions in the authority structure of science ranged from Ph.D. students to presidents and directors of research institutions, their reputation in the reward system from junior researchers to Nobel laureates. Each interview was transcribed in full. The interviews were analysed using a combination of individual case-based and comparative steps (see Witzel 2000; Glaser and Strauss 1967; Strauss and Corbin 1990). In representing relevant categories, the quotes that are used in the presentation of the case ensure the empirical grounding of hypotheses and conclusions.[10]

[9] For the empirical study, a scientist was a priori classified as "visible" if he had repeated media prominence in more than one context (a context being a journal publication, etc.). The sample was composed of visible and not visible scientists from each of the four countries; the classification was based on a literature review and verified by a triangulation with quantitative data (Rödder 2009b).

[10] The expert interview situation is itself a kind of boundary system rather than peer communication. This methodical weakness was dealt with both on the level of data acquisition and data

8.4 Results

8.4.1 Normative Expectations Towards Visible Scientists

The genome researchers' self-descriptions are revealing of the traditional paradigm: "The old school was that if you had your name in the paper then you were doing something wrong" (10:25).[11] But what does it mean when they characteristically speak of an "old school" (31:57)? Do its rules still apply? A visible German scientist has experienced that "some colleagues are extremely uncomfortable if someone gets a high public profile" (22:43); a not visible US researcher confirms: "Highly visible scientists are viewed as slightly suspect by their colleagues" (11:158) Media prominence "smells" (23:67) and therefore public communication is fundamentally in need of legitimation, first of all for one's own professional self:

> To be willing to communicate in public needs to be justified. [. . .] I have been doing that for a while [. . .] and I have always looked for an excuse to myself, why do I do that? (21:89)

How a visible scientist is perceived by a colleague is revealing of this scientist's genuine expectations towards his peer:

> He is the most modest man and he is a true scientist *although* he does some media presentation and you see him on the BBC (28:189, my emphasis).

A junior researcher who was chiefly involved in the UK genome project and who describes himself as "someone who usually is perfectly happy to chat away to journalists" mentions that he turned down a science journalist's request in the final phase of the draft sequencing. The journalist wanted to write a series on human genome research focused on the young scientist but the junior scientist felt "that a series was gonna be quite destructive to my career" (26:76). In the light of his colleagues' attitudes, his worries to repeatedly appear in the media seem to not be without cause:

> The names of [scientist x] or [scientist y] appear in the newspapers again and again and this poses the question, are they really aiming at publishing high quality research in prestigious journals or are they geared towards sound bite production to get media interest? (20:20)

All of the genome researchers see the general public as a relevant audience in several respects, as taxpayers, as patients, as users, some also as a valuable voice in science policy debates. They thus welcome institutionalised interfaces such as PR offices and outreach activities and stress the importance of being in the public eye to secure the resources for big genome science. But they strictly differentiate the visibility of the institution from the media prominence in the boundary role of the visible scientist:

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analysis. The interview was set up as research communication on the issue of visible scientists, and reconstructive analysis was applied in looking for coherence in the interview data (for details on the methodology and a validity assessment, see Rödder 2009b).

[11] The first digit represents the number of the interview, the second digit the coded sequence. Quotes in German and French were translated by the author.

> Scientists are glad that science is out there in the public eye; that is a good thing. [. . .] At the same time, people who appear to be a little too comfortable with the camera and the microphone are often sort of looked down upon by their a bit more professional colleagues (1:157).

For a visible scientist, a tension arises:

> You have to sell your work and sell yourself. But you have to always keep in mind to maintain a certain kind of seriousness (44:14).

This tension is prevalent in reputable and less reputable researchers and on all levels of organisational hierarchies. The ambivalence is intensified by the central role of the media for public debates and their functioning as a system in its own right: "One should not exaggerate. But only sensational claims hit the headlines" (32:72). As assumed, it is only a small number of scientists who become visible. They remain a minority even in the high profile genome case, where this fact cannot be attributed to a general lack of media interest. For the average scientist, the relevance of the media and of being visible remains marginal:

> I have many colleagues whose work will never attract any media attention and there is no need for them to have it and they never even think about it (5:221).

The evaluation that – referring to all scientists in all fields – very few scientists act as visible scientists is reflected in a general scepticism towards the necessity of media training: "I don't know if it would be a right cost versus gain to train scientists like this" (34:23).

But while both visible and not visible scientists in all four countries express unease towards visibility, they also describe some recent changes to the "old school view":

> It's getting less of a hindrance for promotion, it's getting some funding from the agencies, it's encouraged in some places and less frowned upon in some others (13:64).

The diffuse expectation "thou shalt communicate" is now integrated in leading organisational roles:

> When journalists call and say, 'Look the human genome is gonna be published next week, I need to talk to a scientist to have an opinion', they will ask Genopole and Genopole will often redirect that to [director x] as the public figure of Genoscope (34:84).

The head of the institute who is described here as its "public figure" by a member of his team perceives his own media presence as "probably useful to collect funds but I have mixed feelings about that" (17:145). His words express ambivalence that he can neither dispose of for the purpose of resource generation, nor as an expectation that is built into his role as head of an institute. That visibility is part of an organisational role becomes apparent in feelings of guilt of not living up to this expectation, as is exemplified in the self-description of a leading scientist in the UK public genome project:

> There are people who are a bit nervous, or for them it's gonna be a big effort [so they] avoid it. I put myself in that category though I have some guilt about it having been involved in the human genome and large scale things (43:102).

This quote is revealing of another fact. The researchers characteristically attribute their reservation to their personality: they are "shy" or maybe "not used to the public eye". In the following, however, I will draw on the data to show that this psychological ambivalence is rooted in a systematic tension between external expectations and the internal expectations of the peers. As a starting point, however, the reasoning of the genome researchers themselves is examined.

8.4.2 Are Scientists "Media Shy"?

The researchers characteristically locate their unease in their personality structure: "Media and visibility isn't my thing" (7:102). The choice of the primary audience is attributed to a personal preference that apparently is prevalent amongst scientists: "Most scientists are very shy, we want to talk about our science to peers" (33:5). A junior researcher who describes himself as "media shy" (4:7) was asked what this actually meant. He replied that he is "media shy" as a *postdoc* but that he would be willing to communicate if he were a *research group* or *project leader*:

> To be media shy is absolutely relative, I mean, in my rank, with my scientific achievements, I would be absolutely out of place in the media (4:262).

That the postdoctoral researcher points to his current "rank" and a lack of "achievement" indicates that being "media shy" is not his individual trait but a normative expectation towards a junior scientist. A second personality trait that the researchers typically name as a source of ambivalence is jealousy. They consider jealousy as a human condition that is ubiquitous in social situations. Media prominence hence evokes unease because it produces inequality: "Everybody wants to be equal with all their colleagues and that creates unease in any community" (9:39). This explanation is in marked contrast to the meritocratic reward system of science that (ideally) attributes recognition on the basis of scientific achievement. A hierarchy of scientists that is based on their contributions is the ordering principle of peer communities. It is hence unlikely that scientists generally perceive recognition differences as inappropriate. For the attribution of a rank, however, evaluation criteria are needed. Ambivalence towards visible scientists reveals worries that the recognition of a visible scientist is not rooted in scientific evaluation, and that media prominence therefore endangers the reputation autonomy of the peers. Indicative of these worries is the case of the astronomer and visible scientist Carl Sagan:

> There was a famous episode in which he was blocked from being elected to the National Academy of Sciences, and the basic argument of his opponents was 'What has he done besides making all these nice TV programs?' There was a feeling amongst some of his defenders that the bar was actually set higher for him in terms of his papers and so forth than it would have been if he weren't as suspect for having had such a high profile (11:177).

Sagan's case shows that the bar for scientific achievement "in terms of his papers" is set higher *because* he is prominent. As a high profile is based on media criteria, his peers are particularly attentive in rewarding him scientifically with the election to an academy. All of the interviewees who mention the Sagan case assume that his

prominence has damaged his scientific reputation. The "Carl-Sagan-effect" points to structurally induced ambivalence; the attribution to individual personalities that has here been discussed with regard to being "media shy" or "jealous" falls short of an adequate explanation.

I rather argue to understand the ambivalence in the light of the scientific community's attempt to safeguard the integration of a scientific discipline, i.e., the allocation of rewards according to scientific criteria. This claim can be substantiated with empirical data that reveal systematic tensions between the requirements of public communication on the one hand, and the normative structure of science on the other. In the data, one can distinguish structural issues with communicating to the media and other publics in several respects.

Firstly, this communication requires *media skills*, which future scientists do not necessarily acquire in the course of their socialisation. The interviewees struggle to speak "free of jargon" (50:170) to bridge the gap to public communication without losing their scientific credibility. In the routine relationship of science and the media, the genome researchers also typically perceive a lack of media interest:

> People are always saying that we scientists are supposed to talk to the media, but they are not going to be interested in us as we ring them up (41:109).

A second point is that communication is *time demanding*. The small number of visible scientists is explained by the need of resources: "It is a tiny fraction of scientists who have the means and can spare the time to establish a media image" (2:215). To become more visible would imply to "let science slide" (2:345); the production of knowledge would suffer in support of its presentation. It does not come as a surprise that the genome researchers perceive a tension between the role of the researcher and the role of the visible scientist:

> If you spend a lot of time communicating, you must be spending less time in the lab doing science and therefore you can't be a good scientist (34:78).

The third and main point, then, are *conflicting normative expectations* towards visible scientists. Such norms govern behaviour without that we usually call them into question or reflect on them. A certain perplexity in the face of ambivalence towards individual visibility can thus be regarded as a first indicator that normative expectations are involved: "Scientists tend to lose respect for scientists who communicate very much and it is not very clear to me why" (34:79). The interviewees typically found it "bloody difficult" (19:32) to name why there is an issue with visible scientists.

Contradicting expectations that are built into the role of the visible scientist can be specified in a material, a social and a temporal respect.[12] A first tension arises with regard to the material respect in scientific versus media communication:

[12] In all three dimensions of meaning, the interviewees focus on the point emphasised by the differentiation theory perspective that we propose in this volume: the difference in meaning between scientific and mass media communication, i.e., between an orientation towards "truth" and an orientation towards news values (see Chapter 1).

> What makes a nice story? That is the question. It may be scientifically unsound, but it reads well, it writes well. It may not be of scientific interest, not as much as other results, results that deserve a Nobel Prize but that are not easy to understand and to report on (2:709).

The criteria for a nice story differ from the criteria for the Nobel Prize; the media success of a research result is linked to its news value rather than its scientific substance. All of the genome researchers observe, on the one hand, a lack of media interest for most of the areas that scientists are interested in and, on the other, media hype of a few other issues.

> If it is good, it's fantastic; if it is bad, it is like the world is coming to an end. Everything has to be large and that, for a scientist, is completely counter to the honesty that you are supposed to have in all communications about what you are doing (1:31).

Tensions arise between the media's *search for sensations* and the norm of *intellectual honesty* that is binding for visible scientists as well. Even though the scientists acknowledge that they themselves overemphasise the societal relevance of their work in most grant proposals and publications, they view the exaggerations and polarisations in the media's presentation of their work as a major problem.

> For the scientists, the thing to be proud of is the fact that yes, we thought it was gonna work out this way, and after four years of very hard work indeed we can distinguish two types of breast cancer and cure one type and not the other type. And yet the media would like to portray that as 'scientists fail to find cure to breast cancer', there would be this very negative, shocking headline. I read one recently, actually, where it said 'Darwin's theory of life disproved'. As I was reading that I was thinking, 'Bloody hell, that's a strong statement, scientists disprove Darwin's theory of life'. But Darwin originally stated that he thought that hot springs were where life originated, and somebody had gone round and figured out that, really, organic molecules don't last long in hot springs, it's all a bit of a disaster, and it is more likely to be temperate springs. But the headline was almost deliberately misleading and caught your eye. So that's why I think there is a conflict between what the media wants to report and what science wants to state, and that's because the media is looking for more eye-catching statements and these are usually the more negative ones. So that inhibits scientists from going to the media which I think is unfortunate because I think there is quite a lot to be proud of in a lot of science, and it's a bit unfortunate really that we are always countering some negative impressions (26:47).

In the temporal respect, there is a tension between the *time demands of knowledge production* and the *media's time frame*:

> They've been spending 50 years to get the crystal structures. It makes a good publication but not very good press (28:143).

A second conflict in this respect is a temporal restriction for the complexity of statements, i.e., a systematic tension between *sound bites* and *scientific arguments*:

> Even if what you say has no basis at all, it doesn't take very long to make highly damaging statements about someone. To try to defend against those takes a lot of explanation, so you lose dynamic with this sound bite statement (11:444).

A third tension concerns the point in time at which scientific knowledge is published in the popular media. The media release of a research result prior to its scientific publication is marked as deviant behaviour: "What is frowned on is rushing

results out before they are verified" (24:65). The expectation that scientific knowledge has been *scrutinised by peer review* conflicts with *science by press release.* An example for the genome case is the announcement of sequence drafts in June 2000, much prior to their publications in *Science* (Venter et al. 2001) and *Nature* (International Human Genome Sequencing Consortium 2001) respectively. With regard to the timing of scientific publication and media release, the formalisation of PR in scientific organisations poses problems:

> Frequently what happens is that the institution says, 'We have a fundraising dinner coming up next week and Bill and Linda Gates are coming and if we have a cure for cancer they may give us a lot of money'. Do we think this [not yet published research] is important, let's have a press conference (24:41).

A visible scientist critically assesses this formalisation:

> Now the norm is that you issue a press release if you got something exciting before you publish, and this causes a lot of trouble. I don't know what we are going to do about this because, at the same time, if things really are important, the public has a right to be informed (50:227).

In a social respect, a tension builds up between the visible scientist as a boundary role *person* and as a *representative* of the scientific community, i.e., between the personality orientation of the media and the imperatives of universalism and communism in science. Ambivalence that is rooted in that juxtaposition can be found in the self-description (statement 1) of a scientist who got some media prominence as speaker of a consortium, as well as in his perception by a member of the consortium (statement 2):

> (1) On the one hand, it would be great, if everybody who was involved would get some attention but, on the other hand, this is not possible (44:135).

> (2) It wasn't even mentioned that this is a consortium of seven different labs and institutions. On the one hand, of course, this is understandable and he was the coordinator but the way it was presented was not correct (18:15).

This junior researcher struggles to accommodate the boundary role behaviour with her expectations and while she takes into account the circumstances of the situation, she evaluates the performance as deviance from scientific norms. Some interviewees propose to solve this issue by having a different person represent the community each time; some have even tried to direct journalists to colleagues they consider more knowledgeable in the respective field – with modest success, as they report. More media experienced scientists link this failure to the interest of the media in the same person over and over again, to "rent a mouth" (50:313). Known to the media as experts in a field, they are subsequently asked to comment on very different issues.

The second tension in the social dimension concerns the criteria that are used to evaluate achievements in science and the media, the attribution of *prominence* and *reputation* respectively. Visible and not visible genome researchers unanimously note that visible scientists are judged by their "performance" (50:150). "It entirely

depends on the way we would perform. Not at all on the content. This is the problem" (15:33). A tension builds up between external *recognition of presentation skills* and internal *credit for the production of original knowledge*. The media interest in entertaining individuals is contradictory to any of the norms. As I have shown for the case of Carl Sagan, the ambivalence of the genome researcher can first and foremost be rooted in the fact that media prominence is not attributed for scientific achievement and should therefore not be relevant for a scientist's reputation. An individual researcher's primary audience is the peer community and the aim of addressing an audience scrutiny. Peer review cannot be outsourced to the general public: "They have no way of deciding" (34:140). The genome researchers therefore do not regard the public as an audience relevant for what is at the core of their role expectation: "When I think about whether this work is publishable, is it interesting, I don't think about the public. I think about peers" (8:9). As the general public cannot scrutinise scientific claims, it is not the appropriate addressee of any communication that is oriented towards the production of reliable knowledge. This induces the *ambivalence of visible scientists* as the sum of the conflicts that have just been discussed. It is not possible to establish the role of the visible scientist without introducing a systematic tension to the reputation autonomy of the scientific community. Because conflicting expectations cannot be met concomitantly, one has to look at the conditions under which internal and external expectations take the lead in governing a scientist's behaviour. The question whether visible scientists are exposed to conflicting normative expectations can be rephrased: Under what conditions does a scientist become visible *although* public communication induces ambivalence?

8.4.3 Ambivalence Management

Other than the role of the scientist-researcher, the role of the visible scientist is socially inclusive in terms of its publics. It is thus noteworthy that one of the most important mechanisms of ambivalence management in a role-set, the "insulation from full observability" (Merton 1957: 115), is not available. Scientists' proverbial worries about how their colleagues will judge their public appearance illustrate this point: it is not possible to shield the role performance as media visible scientist from anyone's insight.

Boundary role activities address different publics at once and conditions need to be specified under which they are perceived as legitimate: "You wanna do it for the right reasons" (33:115). From the interview data, three conditions can be derived: a scientist's professional merits, whether he is proactive in the media contact, and whether he has an organisational position or goal. Ambivalence management strategies in the boundary role of the visible scientist are thus sound scientific work, the reference to an institutional context and reacting to being asked by the media. While the first condition is unanimously emphasised by visible and not visible scientists in all four countries, the second and third conditions are more controversial.

8.4.3.1 Condition 1: Sound Scientific Work

The quality of a scientist's work is a basic precondition of visibility: "That is where the difference is, whether or not your science is good" (27:31). Grounding media prominence in scientific achievement is a first strategy of ambivalence management: "He has very high media presence but he has got extremely high reputation scientifically" (43:63). Provided that this criterion is met, the actual media format plays a rather minor role. As author of a sound publication, a scientist can happily accept an invitation to a TV talk show:

> Oprah Winfrey, that's about as mass market as you're gonna get. So she was invited on this show, and this is just typical because she wrote a very respectable scientific paper (11:88).

As is marked here as "just typical", prominence as a consequence of sound scientific work is the usual direction of influence at the science-media interface. Subsequent media prominence links visibility directly to the scientific achievement. This kind of visibility can therefore be reconciled with the peers' recognition; it amplifies public as well as scientific attention and may have positive consequences for the career path and reputation of a scientist.

By contrast, the genome researchers identify the visibility of scientists without credibility and the pre-publication of not peer reviewed scientific claims as major visibility problems. Cases in point in the life sciences are claims to have cloned human life by the Raelian sect and the debates on intelligent design. All of the genome researchers emphasise the disintegrating effect of science by press release and stress the importance of the norm "no claims": If knowledge is to be regarded as scientific knowledge, it needs to be certified by peer review. Visible and not visible scientists in all four countries thus unanimously safeguard organised scepticism. This points towards the relevance of linking credit to contribution for the social order in science.

8.4.3.2 Condition 2: Reference to an Institutional Role

A second criterion is linked to the institutional context of a scientist. Visibility is now built into certain organisational roles such as the head of an institute or the speaker of a consortium. The ambivalence management strategy that derives from this condition is the reference to a role expectation: "It's part of my role, my position" (43:106). This condition therefore safeguards the norms of universalism and communism. It is closely linked to lobbying: "There is nothing against promoting the discipline you're in" (7:129). Lobbying is seen as a task that secures resources for the field and is thus an important duty of leading positions, but not restricted to these roles exclusively. Lobbying serves a valuable purpose and, as a boundary activity, can be accommodated with the peers expectations because a lobbyist addresses external publics to gain resources these publics dispose of and, in that respect, these publics are utterly relevant. In the perception of visible scientists this is acknowledged as "Part of [scientist x's] job is to sell the policy". Lobbying is set apart from the not scrutinised-claims-mode of visibility that is problematic.

> He didn't predict any science in that. He just said, 'I got 2.5 million dollars from some foundation to do this.' That's a press release. That's fine (33:138).

In line with this condition, it is consensus that visibility without any reference to an institutional position or goal is not appropriate, i.e., media presence that appears to be motivated by the quest for "self-aggrandisement" (11:47): "If their message is that they are important people, that isn't much of a message" (24:29). Self-promotion is criticised but regarded as human: "Scientists like to impress their mother-in-laws" (9:391). Ego-trips are much rather forgiven than deviance from the expectation "no claims". To address a "mother-in-law-audience" is apparently considered as without much consequence for the integration of the scientific community; in such cases, the individual respect for the person may suffer but not the scientific recognition.

8.4.3.3 Condition 3: No Proactive Media Contact

As a third condition it is relevant how a scientist's visibility came about. Visibility appears appropriate if the initiative at the science-media interface is on the side of the journalist. Again, visibility in this case is usually restricted to the authors of recent publications or to scientists who are asked as experts, which is, in most cases at least, indirectly related to their scientific merits. Visible scientists thus can justify their public appearance by stating that they did not deliberately seek media attention: "I have been asked" (2:681). This strategy safeguards the imperative of disinterestedness. At times, a 350-page popular book develops unintentionally, as its author recalls:

> In a certain sense it was not my choice, or at least not a deliberate choice that's what I should say. [. . .] It was something that just emerged (50:16/19).

Altogether, the strategies of ambivalence management that have been derived from the data show that the researchers distinguish "kinds of visibility" (1: 177), and that it is the kind of visibility that determines whether a particular boundary communication can be accommodated with the science system, as indicated by the very specific reactions of the peers towards the different kinds. Preconditions of legitimate boundary activity are sound scientific work, being asked by the media or the reference to an institutional context. Tolerance for boundary roles appears bound to these conditions.

But how stable is the integrative authority of the scientific community? Can circumstances be identified in which the tolerance for boundary role activities increases? It has been argued elsewhere that the human genome project can be understood as a phase of medialization (Rödder 2009a; Schäfer 2008; Nerlich et al. 2002). With regard to our concern here, the visibility of individual scientists, the data show that in this phase boundary role activities gain importance:

> Some of the more charismatic gentlemen, shall we say, went out and tried to make the arguments in the popular press (33:129).

Facing this situation, some visible scientists adapt their communication to the sound bite style of the media which, in turn, is noticed by their peers as a change in their mode of communication. Not visible scientists accuse visible scientists of self-promotion in a political style:

> The closer the scientists are to the policy level, the more excited they are about showing off as well [as politicians] (26:43).

Tolerance for the split loyalty of a boundary role person increases:

> I am not gonna be quick to criticise people like [scientist x] who were heavily exposed on this issue and trying to improvise as they went along" (11:486).

But how far can the peers' tolerance increase without disintegrating the system?

> That was a difficult position to be in and I think he managed it fairly well by political standards. But he said a lot of things along the way that don't withstand close scrutiny and didn't at the time (11:495).

The quote suggests that the performance as visible scientist is closely observed and linked to scientific criteria in an attempt to integrate the role behaviour into the science system. How far, then, goes the tolerance in times of medialization? To assess the question whether increasing tolerance for boundary role communication – and thus system disintegration – is a trend in ambivalence management, I will finally examine the relation of the role of the visible scientist to the other roles in the scientific role-set.[13]

8.4.4 Visibility as Part of the Role-Set of Scientists?

What are the conditions that determine the preference of a certain role over others in the role-set? Is it personal taste or individual skills that decide whether a scientist devotes time and energy to prepare an experiment, a lecture, or a media occurrence? Sociologically, one would rather assume that the investment in a particular role is weighted against the recognition that can be expected in return. Whether a scientist spends his time writing an article for a local paper or whether he conducts an additional experiment that the reviewer of a publication asked for therefore depends on how the respective effort is rewarded. One thus needs to look at the incentives to act in the different roles.

The data show that the genome researchers' main incentive is the recognition of their peers rather than disinterested quest for knowledge and much rather than media spotlight. This holds true for visible and not visible scientists alike. Indicative of the potential of a role to govern behaviour is therefore whether it is eligible for recognition. The genome researchers express strong expectations that this is the case for the production and presentation of research results exclusively. The interviewees' talk is focused on the production of peer reviewed knowledge as their professional goal.

[13] For a discussion of hierarchies in the role-set, see also Merton (1957: 113f).

As the core of their job, they talk about original and innovative ideas, experiments, publications in scientific journals, discussions at meetings and conferences and the review of their colleagues' proposals and papers. A career in genome research, however, cannot be based on research only. The interviewees describe activities that are not essential to the process of knowledge production itself but that are prerequisites thereof and therefore part of any scientist's job. Most importantly, the acquisition of resources is perceived as a task that is vital for a successful career and a mandatory quality for a scientist. Additionally, the management of a larger group is an important element of the work in genome research; this job is complicated by the interdisciplinary nature of the field. With the rise in organisational hierarchies, time demands for membership duties increase. It is precisely the recognition in terms of a large research group, etc. that turns successful researchers into managers and withdraws them from the work in the lab (see Luhmann 1992: 678). Characteristically, scientists speak of this paradoxical development as "frustrating" (42:141). This perception reflects the primacy of the reward system over the authority structure of scientific organisations (see Goodstein and Woodward 1999) and points towards the hierarchy of the roles in the scientific role-set. The emphasis on the functional primacy of knowledge production suggests that the role of the researchers is at the core of the role-set; the pursuit of recognition by way of scientific contributions the top priority. The role of academic teaching is unanimously separated from the core in its relevance for the scientist – it is not eligible for reputation. Teaching as well as self-administration can thus be conceptualised as secondary roles, likewise the boundary role of the visible scientist (Table. 8.1).

The self-descriptions of all of the genome researchers suggest that the expectation to be visible is an expectation that is not perceived as an essential part of their job duties. Visibility is "somehow optional" (43:24), "tertiaire de la recherche" (13:54) and "rather irrelevant for the real thing" ["für die Wirklichkeit relativ unwichtig"] (22:44); in all four countries acceptable as a boundary activity, but not eligible for reputation. The autonomy to allocate reputation remains for peers only.[14]

Table 8.1 The role-set of scientists

Professional role		Scientist	
Core (eligible for reputation)		Researcher	
Secondary/boundary roles	Teacher	Manager	Visible scientist

[14] The reputation autonomy of the scientific community is safeguarded by all of the interviewees, but beyond this common ground, types of scientists can be differentiated on the basis of their construction of the public and their willingness to adapt their communication: the geek, the missionary, the advocate of knowledge and the public scientist (Rödder 2009b).

8.5 Conclusions

For the case of human genome research, the data show a striking ambivalence towards the visibility of individual scientists. The ambivalence is prevalent in the talk of visible and not visible scientists in four countries that work in a high profile field, indicating that every scientist is confronted with conflicting expectations with regard to the boundary activities of some colleagues. The role ambiguity is revealing of the fact that contradictory normative expectations are involved in addition to the well known time constraints and lack of presentation skills.

Drawing on Merton's analysis of ambivalences of scientists,[15] this paper extends the sociological study of conflicting expectations in the role-set of scientists to public communication. That the expectations induce ambivalence verifies, first of all, that the normative structure, which has been described as the ethos of science, is firmly in place in the researchers' talk. At the same time, a context in which science is increasingly asked to justify tax dollars or private investment brings about the demand for public communication. For science as an institution, the public becomes relevant in several respects: as tax payer and venture capitalist they fund research, as patient and user they apply products and technologies; and a positive or negative public opinion towards a certain field cannot be ignored in science policymaking. With regard to the institution, these publics can allocate or withdraw resources; to strive for these resources by way of societal relevance is a sine qua none for the institution. The human genome researchers acknowledge that by broadly accepting the visibility of science as an institution. The interviewees in all four countries unanimously welcome the institutionalisation of PR and outreach activities at the level of scientific organisations. At the same time, they express a striking unease *as* and *towards* visible scientists. Scientists who become media visible are confronted with expectations that suggest a different practice in a material, temporal and social respect. In a material respect, there is a tension between the reliability of scientific knowledge and between the media's interest in news value. In a temporal respect, a tension arises between the time frame of knowledge production and peer review and the issue attention cycles and presentation formats of the media. In a social respect, finally, the role of visible scientists as members of a scientific community and as media stars is conflicting with regard to the relation of scientific and media recognition.

[15] Merton's ambivalence was found in the interview data as well: "Well, I am not really after prizes, but, on the other hand, to get one is not bad at all" (42:110). Further ambivalences are also present: for example, the tension between different role-sets of a person such as being torn between the professional role and the role as a family member. The relation of the professional and the family role shows that a structural dominance of the professional role is rather widespread amongst scientists in general and, in particular, amongst geek-type scientists. This allows to speak of a "hyperinclusion" in science, a phenomenon first noticed with regard to professional athletes (Göbel and Schmidt 1998). This tension, however, is not a sociological ambivalence in the narrow sense of the term, but a "derivative type" (Merton and Barber 1976: 9).

Facing this situation, the *ambivalence of visible scientists* arises: as a reaction to the demands for visibility but as unease towards visible scientists. Visibility is in need of justification because publics other than scientific peers are not the audience to judge scientific claims and thus not the addressees of a scientist's primary role as researcher. The role of the visible scientist can be integrated as a boundary role in the role-set, occupied by a minority of scientists and with the main incentive to secure public and private research funding. But the genome case provides evidence that it is not a regular job duty. On the basis of the analysis of this high profile case, one can conclude that the view that visibility is now built into the role expectation of every professional scientist, including being eligible for reputation, is policy talk rather than an empirical fact.

Because the demands which boundary role occupants are expected to fulfil are inconsistent, they cannot be fully formalised, i.e., illegitimate visibility cannot be precluded categorically. Other than institutional boundary activities, that can be formalised in a mission statement for the PR office or an outreach activity, the purpose of individual visibility is much less determined. The split loyalty in the boundary role allows adapting scientific communication much more freely at the interface. This is useful in face-to face interaction between scientists and journalists and may account for the prevalent finding that – despite conflicting expectations – the routine interactions between scientists and science journalists are mutually perceived as satisfying (e.g., Chapter 11). This functional solution, however, has consequential costs. It matters with regard to individual scientists, not with regard to scientific organisations, that, in the boundary system, the presentation of scientific knowledge is not systematically linked to its production. This offers an explanation why scientists strictly differentiate institutional and individual visibility. Individual visibility is legitimate as a boundary role, but there is a deep ambivalence towards it. The widespread occurrence in the self-descriptions of both visible and not visible scientists indicates that the ambivalence of visible scientists is not a psychological problem of individuals but structurally induced by trying to live up to conflicting expectations. To be visible – meeting the expectations to communicate with extra-scientific publics – and to be a scientist – bound to the normative structure of science – is an ambiguity that is built into the role of visible scientists. The ambivalence is intensified because the science-media coupling links visibility to the rules of the mass media.

At the science-media interface, the institutionalisation of science PR (Peters et al. 2008), more science in the news (Elmer et al. 2008) and a number of hypes and media events have been witnessed in recent years, but there is much less evidence that public science communication is by now seen by scientists as part of their job. If the issue was solely one of lack of skills or time demands, one would expect that two decades of media and communication training should have started to eliminate it. If the reservations towards visibility were rooted mainly in the absence of presentation skills, such training should enhance the number of visible scientists, at the least in times of high media attention, where a lack of public interest cannot account for the fact that visible scientists remain a minority.

I have argued instead that, in addition to time demands and the gap between scientific and public communication, the unease towards visible scientists can be explained sociologically by an ambivalence that is built into the role of the visible scientist. Most work in science and technology studies sees the difficulties in communication at the science media-interface as stemming from an urge of the scientific community to protect its autonomy, and therefore does not recognise this role ambiguity. For the theory and practice of science communication, where the time constraints and media competences are now frequently discussed, the study allows concluding that the issue that needs to be addressed is beyond the scope of current media and communication trainings because it is not merely a lack of skills or time. If visibility is to become a professional duty, media prominence needs to be established as eligible for recognition. The price is yet another ambivalence of scientists.

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