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Objectivity and the Scientist: Heisenberg Rethinks

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Argument

Objectivity has been constitutive of the modern scientific persona. Its significance has depended on its excision of standpoint, which has legitimated the scientist epistemically and sociopolitically at once. But if the nineteenth century reinforced those paired effects, the twentieth century brought questioning of both. The figure of Werner Heisenberg (1901–1976) puts the latter process on display. From the Kaiserreich to the Federal Republic of Germany, between quantum mechanics and interest group politics, his evolution shows an increasing openness to perspectival pluralism, together with an attempt to save some form of objectivity as discursive coherence. Heisenberg's self-understanding and the reactions of his publics display the transmutation of the persona as objectivity was rethought. By the end of the day, speaking "as a scientist" would mean something different from what it had at the start.

Personae effect agency, this issue of *Science in Context* suggests, in a world that deals as much in types as in individuals. Just for this reason, an effective aspect of the scientific persona has been the attribution of objectivity. Scientists, in the ideal, do not speak for themselves. They speak for an extrapersonal reality and a consensus beyond contest; they speak as knowers in the abstract, not specific individuals. That attribution, consolidated since the Scientific Revolution and the Enlightenment, stands in a symbiotic relation with the persona itself. Putting the partial and particular in tension with the universal, objectivity has inculcated a characteristic ideal of personality. At the same time, and by the same means, it has sanctioned two very powerful supraindividual consequences. The first is the intrinsic validity of scientific knowledge. The second is its suitability as a basis for sociopolitical action.

The twentieth century was hard on faith in classical objectivity, and in several domains at once. My account shows a scientist trying to come to terms with those changes even as he drove them ahead. Werner Heisenberg was a product of the German *Bildungsbürgertum*, or educated bourgeoisie, a co-creator of quantum mechanics and its Copenhagen Interpretation, a young Nobel Laureate who quickly moved into the public eye, later a statesman of science policy and an advocate for scientists' needs. He was at once a public figure and a highly private person who struggled with the relation between subjectivity and the collective. As an individual

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filling the generic function, he not infrequently prefaced remarks with the notation, "As a scientist . . .." Speaking in this voice, he could come to stand in for "the scientist" at large. Yet over his career he found himself weakening the notion of the scientist's objectivity in sometimes self-conscious ways. His trajectory tracks in an interesting fashion the twentieth century's rethinking of its intellectual inheritance. Renunciation of triumphant convictions – about science, about politics – was accompanied by the maintenance of some remnant of a chastened faith. It ended up with a liberal pluralism of perspectives held together by increasingly tenuous forms of discursive coherence.

Important here is that the reworkings of objectivity for science, politics, and the self could belong to a single narrative. The notion of the persona has value for historians wary of compartmentalizing scientific activity as separate from the rest of a life. Heisenberg's desire for coherence, typical of his tempered modernism, indeed made fragmentation a poor option. It also made him see connections between his physics and other realms of his experience. By the mid–1930s, he was already telling students that "whoever listens closely to the natural sciences can discern how intellectual life (*das geistige Leben*) will develop in the future" (Heisenberg 1935). The developments undermining strong objectivity in its different realms were not for him entirely separable. In practice they were bound together by his perception of a historical trajectory, and a personal bearing that made them mutually reinforcing.

The setting for his story is the familiar one of nineteenth- and twentieth-century Germany. However, the contexts that give meaning to his actions are not always the ones most ready to hand. This essay reads debates over natural knowledge together with those about parties, interest groups, and parliamentary democracy, positioning the theorists of quantum mechanics alongside those of liberal individualism. The analogies may seem curious, and limited space will keep them schematic. In the end, however, the exercise is illuminating – regarding Heisenberg, I hope, but also bigger things. The familiar narrative of German modernity as a parable of political reaction and self-absorbed quietism has shown its limitations outside the history of science. The tensions between hopes for universality and the possibilities of pluralism suggest new ways of telling that story, too.

Objectivity

Objectivity – *Objektivität* in German – is not a simple notion. For students of science, it designates a state of access to reality. For students of human affairs, it denotes the condition of disinterested impartiality. The two domains might initially seem distinct: what links juridical detachment to determination by nature? Where the meanings approach one another is in the excision of particular standpoints. For something given by nature itself, not subject to human influence, is assumed free of all remnants of individual points of view, and *for that reason* it can be acceptable to and binding upon all (e.g., Brockhaus-Wahrig 1984). The problem of the standpoint, which is the

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problem of partiality, partisanship, and particularity, is as central to ethics and social life as it is to epistemology. Whatever the domain, Thomas Nagel's famous "view from nowhere" results from progressive self-distancing from a particular position (Nagel 1986). Expanding one's perspective, it brings one's own standpoint into the picture. It is the secular correlate of a God's eye view, to be achieved, one might hope, through mechanisms of self-discipline.

Objectivity may remain an untidy amalgam of concepts (Daston and Galison 1992). For our purpose, its interest lies in the simultaneous reference to the natural and the human realms. Its elevation to the status of a scientific norm, it has been argued, went hand-in-hand with the modern reconstitution of the polity. In the Scientific Revolution and the Enlightenment the notion's dual nature was clearly on display (Shapin and Shaffer 1985; Dear 1992; Latour 1993; Poovey 1998; Golinski 1992). Then tracking the concept through the period that followed, we see its demands ever gaining in importance and stringency. With new technologies of objectification, scientific observers' reports would be subjected to routinization, quantification, and replacement by mechanically registering devices. The goal was truth to nature, via intersubjective concordance. In those terms, objectivity truly came into its own in the course of the nineteenth century (Porter 1992; Daston 1992; Porter 1995; Daston 1999). Yet in human affairs as in science, the same period saw a comparable revisiting of the relation between the individual and collective. For if objectivity expressed the tension between particularity and universality, it could be transposed to the languages of social thought and political economy.

That is, in the terms that agitated contemporary debate, it spoke to questions of private interest and public good. How could the pursuit of individual interest, the rationality of the market, lead to anything like social order? To wring a universal order from particular advantage, uncompromising liberal individualists might appeal to Benthamite summation or Smithian invisible hands. As long as private interests had metaphysical primacy, the common welfare was ontologically derivative: that was the hard-line solution to the particular and the general. However, for other schools of thought (even for a John Stuart Mill), the notion of a really and distinctly common good was not anachronistic (Pocock 1975; Hirschman 1977; Benn and Gaus 1983). German theorists of the *Vormärz*, before the 1848 revolution, tended to distrust what they understood as the hard-line English program. However else they differed, when they made the move from the partial to the universal, they took the vocabulary of objectivity for granted.

So what was the alternative to the normative indeterminacy of utilitarianism and the miraculous ordering of *laissez-faire*? In its classical German form, liberalism drew in Enlightenment notions of the public-minded citizen and established conceptions of the rational state (Muhs 1981; Schulze 1986; Pankoke 1987). With the pathos of reasonable men standing above interests and classes, classical German liberals saw in themselves the disinterested spokesmen for the common welfare. A broad spectrum of Hegelians would put forward the state as objective reconciler of particular interests.

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Chiming in with the liberals' synthesizing, nationalist ambitions, this objective order has come to sound suspiciously organicist and conservative. But it was not always so. Left Hegelians would hardly abandon the communal good, either. Marx and Engels famously unmasked contractual individualism as the ideology of the bourgeoisie; they stamped liberalism and its claim to speak from nowhere as its apologia for its own class advantage. So who truly spoke without partisan interest? The identity changed (the proletariat, not the middle class), but a universal subject was still there (Whitebook 1981–82; Orth and Koselleck 1982; Walton 1983; Dallmayr 1993).

Objectivity was claimed for both natural and human orders. The links it licensed, while elective, were powerful. Scientific knowing could be more than a model; it could be bound up with a social and political program. Ideal values set off political resonances for scientific progressives on the model of Virchow or southwest German liberals who linked knowledge to power (Borscheid 1976; Tuchman 1993; Goschler 1997; Daum 1998; Phillips 2000). Once speakers abstracted from status and put aside partisan interests, free, reasoned discussion would not divide but unite. For what was objective could be agreed upon by all, reconciling independent minds in consensus without doing liberty violence. Ideal connections like these, formed in the *Vormärz*, would be partly recast as the century progressed. Were loyalties to abstract universal principles, or to some cultural collectivity? The rejection of identity politics largely operated within national boundaries. The point of the appeals to science also changed as socialists organized as a working-class movement and liberals faced off in the new German empire across the progressive-national divide (Wise 1987; Lenoir 1992; Anderton 1993; Daum 1998).

With industrialization and class conflict, even Marxists began to lose faith in ultimate social reconciliation. Among liberals, the legitimacy of interest representation grew into a point of sharp internal contestation (Schieder 1958; Lamer 1963). But with escalating class tensions, fears of destabilization led most liberals to claim ever more actively to speak for the social or national whole. Their ambivalence towards parties, even their own, caused them troubles in organization. Well into the era of mass politics, they were equivocal about imposing a party line and left leadership to notables (*Honoratioren*) instead of professional activists (e.g., Sheehan 1978; Jarausch and Jones 1990; Langewiesche 2000). While *Gelehrtenpolitik*, a disinterested politics of academic expertise, found practitioners across the political spectrum, it reached particular heights in the segments of the educated bourgeoisie who supported national- or left-liberal policies (vom Bruch 1980; Döring 1986; Proctor 1991; Smith 1991; Schiera 1992; Hübinger 1994; Repp 2000).

Of course, we have been trained to look behind claims to objectivity. In studying science we historicize the notion. In human affairs we are confident that a nonpartisan politics is a chimera, and we are skeptical of people who cannot admit that their views might have locations. If such moves go beyond a simple-minded sociology of interests, they give a useful perspective. For who can articulate what is objective? What must they do, how do they learn? The thing that could bind together scientists and nonscientists was their shared attempt to get past a standpoint. The

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scientist's regimen and Humboldt's *Bildung*, Hegel's state and the progressives' social order: these all called on the subject's self-determined discipline and conscious self-governance in the service of supraindividual ideals. Cultivation was not meant to imply fostering one's idiosyncrasies, nor liberal individualism a polity recognizing self-interest alone. They meant expanding the particular in the direction of universality. Ultimately these efforts shared roots in notions of human self-formation and cultural constructions of personal autonomy.

This form of aesthetic individualism, following some of its own advocates, can be given a *Kulturstaat* reading of holistic inwardness and unquestioned allegiance to the state (Krieger 1957; Ringer 1969; Stern 1972). More fruitful, however, is to admit its capacity to inspire reactionaries and social democrats at once. Then liberal thought could become an exemplary arena for working out the tensions between appeals to different universalities, between cosmopolitanism and nationalism, between individualism and the collective (Bollenbeck 1994; Hübinger 1994; Hettling and Hoffmann 1997). The techniques of self-discipline may have been more effective in science than in politics. However, the call to work away from the particular could bring the two efforts into line.

Modern Physics

In Max Planck's account, the scientist's aim was to articulate a picture of the world abstracted from *all* original location: from the individual researcher, from nationality or century, ultimately from the human race itself. There was a certain inverted ascetic pathos to Planck's attempt to imagine a science that would make sense to a Martian. Albert Einstein, too, famously commented upon his disengagement from the "momentary and merely personal." This was for him a response to the "atomizing of the life of every human being" by particularities of individual situation and consciousness (Planck [1909] 1958; Einstein [1949] 1959, 7). For its exemplars, the commitment to an objective science bore with it certain obligations of personal austerity, a tolerance for the abstractions of the disembodied view. Within physics the ideal could be expressed in classical pictures of a world unfolding objectively in space and time. The terminus, in Planck's or Einstein's terms, was exactly the view from nowhere. Heisenberg would later describe it as "the grand attempt at an objective science" undertaken in the spirit of the nineteenth century's ideals (Heisenberg [1931] 1984, 31–32).

By the 1920s and 30s, with the arrival of a self-consciously "modern" physics, a new debate would arise over these issues. Relativity and quantum mechanics were initially framed by classical physicists like Einstein and Planck. However, they could be construed more radically – and were so by some – as reintroducing the observer and his standpoint. Much of this vogue was idle chatter by people with a taste for transformation but little knowledge of physics. That should not blind us to the fact that some such reflections, coming from within the discipline, were grounded in

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practitioners' experience and seriously meant. The advocates were the familiar spokesmen of the Copenhagen Interpretation, Niels Bohr, Max Born, Wolfgang Pauli, and Heisenberg. For our purpose, one element of their doctrine stands out. If a scientist resolved to measure particle properties, they suggested, particle properties would be measured; if he was interested in wave behavior, that was what he would find. Complementary perspectives remained polarized, finding no observational reconciliation, and it was pointless to talk of how nature was independent of particular experiments (Bohr [1929] 1987; Heisenberg [1934a] 1984).

In the quantum world, observers could only be partisan. Every view was tied to a location, to concrete apparatus and queries. For Einstein, Planck, and like-minded colleagues, this amounted to a withdrawal from the discipline of science. Their ultimate objections to quantum mechanics, it has sometimes been noted, dealt less with uncertainty or acausality than with the abandonment of objectivity (Fine 1986; cf. Heilbron 1986). To the advocates, however, the concession was positively obligated by the development of physics itself. It meant taking Planck's and Einstein's abstraction to a higher power: now doing without intuitive pictures, observational coherence, or a world unfolding independent of the observer. Heisenberg framed the lesson of twentieth-century physics as learning to relinquish nineteenth-century security. Renunciation was indeed a term of the Copenhagen art, but in a sense that viewed it as the unavoidable continuation of a historical trajectory (Heisenberg [1933] 1984; cf. Heilbron 1985; Forman 1971; Wise 1987).

As Heisenberg would write in the middle of the Second World War, "We are more conscious than was earlier science that there is no secure starting point . . . all knowledge floats, as it were, over a bottomless abyss" (Heisenberg [1942] 1984, 192). How far did this undermine the venture's epistemic status? In place of objectivity Heisenberg fell back on objectifiability, essentially the projection of the world onto a particular plane of phenomena (Heisenberg [1934a] 1984, [1942] 1989; Chevalley 1998, ch. 3). The scientist sought to objectify – such was the nature of the project – but limits arose in certain realms. Yet these realms, he ultimately maintained, were not beyond the reach of scientific language: "for even when a state of affairs cannot be objectified in this sense, still *this* fact can be objectified in turn and examined in its connection with other facts" (Heisenberg [1942] 1989, 50). The observer had to be brought into the picture. What rescued science was objectivity at the metalevel, including an explicit reflexive element. This was the character that left it, even while subject to human influence, still acceptable to and binding upon all.

Heisenberg's constitution of this weakened objectivity looked to intersubjective concordance without a metaphysical grounding. To bridge over the abyss, he then followed Bohr in building on language (Chevalley 1995). As he would put it in his memoirs, science comes into being in dialogue – in conversation, discourse, *Gespräch* (Heisenberg 1969, 9). Even as he took a lesson here from lived experience, he meant the remark in an epistemologically elevated sense. In intersubjective exchange, particular points of view were, if not reconciled, then at least coordinated. This made quantum mechanics more stable than pure anything-goes. The social process of

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communication allowed him to hold onto something at least quasi-secure: if the view from nowhere was no longer tenable, robust intersubjectivity was the best replacement.

The shift eventuated in prescriptions for the scientist's behavior. What was called for was not unearthly detachment, but debate and exchange. On order were both the boldness to expound a partial perspective and the discipline to acknowledge limitations articulated by others. And in the end the individual would stand for a particular view but still disappear behind the work. This was how Heisenberg narrated his own experience, including the origins of quantum mechanics, of course. His memoirs, after all, were constructed as dialogues. (The title was apposite: *Der Teil und das Ganze*, the whole and the part.) It was how he imagined himself practicing physics, and it could ultimately show in his technical work: in the radical intuitions he offered, half-worked out, for critical scrutiny – ferromagnetism, nuclear structure, quantum field theory, turbulence – and in the dialogic exchange underwriting his best papers, shaped by long interchanges with Pauli and Bohr (Pauli 1979, 1985; cf. Frayn 1998; Beller 1999).

The tensions are suggestive and never entirely resolved. Was the individual to articulate a particular standpoint or to exercise self-discipline in acknowledging others'? Would the outcome be agreement, or agreement to disagree? Despite real respect for Einstein, Heisenberg could not make sense of his colleague's objections to quantum mechanics. He ended up attributing them, rather too easily, to a relapse to a nineteenth-century outlook (Heisenberg [1955] 1986). However much he appealed for seeing the other party's point of view, in practice he was not particularly good at it. In his life, too, Heisenberg faced the continual problem: how to discipline the individual, in a non-coercive way, so as to bring him into tune with something more expansive than himself. For a man who was truly a consummate individualist, this sort of intersubjectivity was a knotty problem.

Objectivity remained tricky, too. As an ideal it retained value, in practice it was unattainable, and the delicacy of the matter caused Heisenberg a certain degree of trouble. The signs are subtle: in ordinary written usage he sometimes seemed to avoid it. Where others might naturally employ the word *objektiv*, he tended distinctly towards *sachlich* or *vernünftig* instead. It became a term he no longer had unproblematically at his disposal. Its resonances are indicated by the few places he allowed himself its use. To make sense of them, however, we must first look elsewhere.

Political Instabilities

After the turn of the century, sociopolitical reconciliation might seem increasingly utopian as well. From the Kaiserreich into Weimar, class strife, mass parties, and parliamentary fragmentation were subjects of despairing commentary. Interest representation and clashes among pressure groups became a regular part of political

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life. So did the resort to acid ideology-criticism to unmask the interests behind adversaries' representations. These, too, worked changes in bourgeois and left political thought. The standard liberal line, both national and progressive, continued to deplore lobbying and special-interest politics. However, some perceptive theorists of *Gelehrtenpolitik* took perspectival pluralism as a challenge. It may seem bizarre to read Heisenberg against his social scientific contemporaries; but in both domains similar things were at stake. The effort to define the possibilities of knowledge, given the ineradicability of standpoints, brought a few legatees of the classical tradition to reconstruct objectivity without a metaphysical ground.

The version most familiar to historians of science may be Karl Mannheim's sociology of knowledge. Mannheim took up the originally Marxist strategy of ideology-criticism to ground a new science of politics. Once it was conceded that *all* views (including Marxists') were partisan and located, he argued, "'objectivity' can be established only in a roundabout way" by metalevel comparison (Mannheim [1931] 1969, 258; cf. Kettler and Meja 1995; Kaiser 1998). Reflexive historians might ponder the Weimar origins of this sociology of interests; a similar preoccupation is apparent in Max Weber's methodological reflections. The modernist revision of liberalism to which Weber subscribed forced him to acknowledge the plurality of standpoints. Fundamental divergence persisted in matters of value, and social science had to relinquish the ambition of reconciling the perspectives. If an objective science could be built up anyways, it was because scholars, precisely in acknowledging their locatedness, could learn to work with and around it (Weber [1904] 1968, [1918] 1968). Mannheim still held out the possibility of a total perspective on the part of free-floating intellectuals. In that respect Heisenberg's solution was more like Weber's. What all shared was the demand for reflexivity and self-discipline by a still autonomous subject, as Weber so stringently insisted in "Science as a vocation" (Weber [1919] 1968).[1]

It would have surprised Weber (though not Mannheim) to imagine Heisenberg chiming in. For Heisenberg himself, articulating the connection would take some time. During the early years of his scientific career, he had little patience for party politics. As a student of science and a child of the *Bildungsbürgertum*, he did not see himself as an interested party or a political being. Weimar politics remained to his mind an irredeemable contest among factions and interest groups, while some identification with German values, suitably purified, seemed credible (Cassidy 1992). The standard question, on reaching this point in the narrative, has been where that

[1] The point had been made already by Nietzsche, who looked to the "preparation of the intellect for its future 'objectivity' – the latter understood not as 'contemplation without interest' (which is a nonsensical absurdity), but as the ability *to control* one's Pro and Con and to dispose of them, so that one knows how to employ a *variety* of perspectives and affective interpretations in the service of knowledge" (Nietzsche 1887 [1989], 3:12). The same thought can be traced through Peirce and other contemporary thinkers, wherever epistemologies of disinterested perception were called into question (see Haskell 1984). Heisenberg became acquainted only later with Nietzsche's *Naturphilosophie*; but when he did, he described it as "extraordinarily interesting" (Heisenberg to Alwin Mittasch, 5 November 1952, in Heisenberg Papers).

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places him on the political spectrum. The best answer is, it does not. The values he brought with him from his family, and those he picked up in the youth movement, were politically labile, interpretable either to the left or the right.[2] More profitable, given our limited sources, is to follow the question of partiality.

For the polarized politics of the Weimar Republic found few defenders in the German educated strata, who, with the exception of the remnant left-liberals, kept their distance from the parliamentary-democratic order. Pathetically invoking some common good, the liberal parties dwindled through the 1920s. Their middle-class voters switched allegiance to special-interest groups (professional organizations, splinter parties) and to the increasingly vocal nationalist right. The banner of national solidarity was seized by the National Socialist German Workers' Party, whose desired national-social order stood against cosmopolitanism and individualism. At the same time, the Nazis engaged in running battles with class-based movements of social democracy and communism while broadcasting divisive antisemitic rhetoric of their own. Pluralism was indeed part of the Weimar vocabulary. However, it came with the distinctly negative valence it gained from theorists like Carl Schmitt (Jones 1988; Jarausch 1990a; Childers 1990; Kaiser 1956). Some academics found their way, left or right, to party membership and engagement. For those who held to their self-perception as standing above parties, none of these options was appealing (Hering 1991; Jansen 1992; Harwood 2000).

So far as we know, Heisenberg did not join a party. His response was to retreat into realms like friends and family, work, an international community of scientists that he wished were isolated from such contests. This was not a successful move, particularly not after the National Socialists came to power and began inserting the Party into the government. When they extended their control to academic life, scientific objectivity was drawn into the conflict. Remaining formally impartial could also strengthen the regime. Heisenberg, unsurprisingly, took no party affiliation now either, but continued to live and work in Germany (Walker 1989; Cassidy 1992). His sense that the resulting compromises were justified was not shaken by personal reflection or criticism by others. His integration within the system, including the expertise he lent to the Third Reich's fission research, have long given rise to arguments about his intentions (Powers 1993; Rose 1998; Frayn 1998; Dörries 2001). Those debates are radically unresolved. One thing, however, does seem clear: open partisan engagement was not on his agenda. While the Third Reich pushed him to think about the situatedness of scientific endeavor, it also made the category of political objectivity hard to give up.

[2] As absurd as some might find this, I suspect the early Heisenberg was, if anything, a liberal. His participation in the workers-education movement *and* the suppression of the Munich Soviet seem to me characteristic, as does his choice of Hindenburg for the presidential election of 1932 (Carson 1999, 131 n. 40). Cassidy (1992) shows that his branch of the youth movement had a mind of its own. Then inferring his political allegiances from his behavior in the Third Reich is an interesting game, but hardly a conclusive one.

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By most measures, theoretical physics did not prosper under the Nazis. Heisenberg believed matters took a serious turn with the move to characterize relativity and quantum mechanics as particularistic offspring of "Jewish" thought. When truths about nature were claimed to have racial origins, defending modern physics meant espousing a science beyond standpoints (Beyerchen 1977). Heisenberg perceived the attack on "Jewish" theory as an irrational reversion enforced by illegitimate means. Its proponents, often Party members, reframed scientific disputes in partisan terms. When Party organs promulgated their views, heteronomy threatened to replace free consensus. Heisenberg hoped to answer the narrative of Aryan physics with a disciplinary history "free from the distortions arising in the conflict of opinions of the day." This would be an account, as he said in a lecture of 1934, that made sense of the developments "as objectively as I am able" (Heisenberg [1934b] 1984, 96).

Despite uneasy concessions to the rhetoric of perspective – Heisenberg was hardly a disinterested observer – the scientist had to maintain a dispassionate bearing. But the reframing of objectivity in modern physics could ironically be at stake. Certain key terms in Heisenberg's interpretation of quantum mechanics – for instance, objectifiability – were first given real substance between 1933 and 1945. When he maintained that Maxwellian electrodynamics would have come into being without Maxwell, or relativity without Einstein, he was expressing both political expediency and straightforward scientific conviction (Heisenberg [1943] 1989, 205). His choices about how to speak on behalf of his discipline in the Third Reich, perhaps even in the fission project, can be read in this light (Cassidy 1992).

In denazification testimonials after 1945, Heisenberg uncomplicatedly described the Aryan physics conflict as a "struggle against Party prejudices" (Heisenberg to Kultusminister Voigt, 11 February 1950, in Heisenberg Papers; cf. Walker 1989, 1995). The Third Reich remained for him the last realm to which the notion of objectivity applied anything like unambiguously. After the war, the few, highly charged spots where he continued using the word give a sense of the power it still held. One was in characterizations of scientists who had been Party members but had taken the side of modern physics. Another was in hopes, expressed with varying degrees of optimism, for an impartial recounting of his wartime work on nuclear fission (Heisenberg on L. Schiller, 17 April 1947, in Heisenberg Papers; Heisenberg to Karl Wirtz, 17 December 1965, in Generallandesarchiv Karlsruhe, KfK/INR). Finally, there is his only partly reconstructed faith, expressed with greatest force in lectures immediately after the war, his belief in science as a search for truth above the fray of persons, ideologies, and nations. Such uses bore an emotional load, and they were not always unself-conscious. That he could put the word "objective" in scare quotes, yet make it central to his message (Heisenberg [1947] 1984, 387) discloses its conflicted status.

During the war, in a private manuscript, Heisenberg had begun to acknowledge the possibility of irreconcilable differences in human affairs. The ability he ideally ascribed to the British and Americans, "to view human relations from all sides, hence justly, and judge soberly and detachedly (*nüchtern-sachlich*)," was, he thought,

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anchored in the English language and the Anglo-American form of life (Heisenberg [1942] 1989, 152). This meant, however, that it could not be learned easily. For Heisenberg it took concrete experience, over time, to bring home a real appreciation. So, too, did the recognition, slow, difficult, and incomplete, that colleagues abroad would never share his view of his decisions and actions in the Third Reich.

Science and the Political Order

Where National Socialism might allow for easy distinctions, liberal democracy would slowly complicate things. In 1945 the Allies dismantled the Third Reich and laid the foundations for its replacement. The new (West) German polity would appropriate certain notions from Anglo-American political thought, drawn through the filter of German conceptions. It would also respond in complicated ways to assessments of its predecessor. Liberal democracy as political freedom was lent weight with invocations of the autonomous personality. On this point a consensus reached from the humanist Left to heroic conservatives and from shaken spokesmen for the *Bildungsbürgertum* to Catholic theorists of Christian Democracy (Laurien 1991; Pankoke and Rohe 1999; Schildt 1999). Yet neither for the Social Democrats nor for the new Chancellor Konrad Adenauer did the new order imply a hard-line liberal political economy. West Germany's "social market" system valued individual freedom but insisted that economic activity be directed in the service of the common welfare; "Manchester" liberalism, the unbridled pursuit of private interest, did not appeal to anyone on the political spectrum (Ambrosius 1977; Nicholls 1994).

One powerful motif of postwar reform proved to be the renewed appeal for a nonpartisan politics. Any number of professions (physicians, attorneys, social scientists) had long claimed the role of spokesmen for some common good (Huerkamp 1985; Jarausch 1990b; Ledford 1996; Siegrist 1996; Raphael 1996). If the Third Reich had hardly been entirely inhospitable to their claims – viewing things from Aryan physics, Heisenberg was less inclined to perceive this – still the models, contrasted to the stock figure of the Nazi ideologue, could be retained past 1945 (Proctor 1988; Weindling 1989; cf. Beyler 1996). In the earliest postwar years, lower-level governance was often overseen by consensus-oriented councils based on corporatist representation. The public good, a really existing thing, was to be secured by pragmatic attention to objective needs (Holtmann 1989; Prowe 1990; Prowe 1993). The presumed bearers of disinterested expertise included civil servants, in the familiar conception of the nonpartisan state. But equally legitimated – or even more so after the Third Reich – were private sources of hands-on experience.

After World War II, it proved easy for natural scientists to imagine themselves in this function. As physicists' public status skyrocketed, Heisenberg evidently felt his moment had come. In 1948 he and some colleagues began to agitate for a body that would exemplify his initial understanding of postwar objectivity. The independent German Research Council they proposed, standing alongside the government, would

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offer much-needed guidance on science policy, funding, and organization. Scientists, after all, had transformed domains from industry to health to war, a fact Heisenberg thought the Nazis had failed to recognize. In this modern world, the public welfare could not be promoted without expert advice and vast amounts of scientific research. The council highlighted science's practical uses, and the orientation to the common good was to be complete. Council members, chosen from elite scientists on an *Honoratioren* basis, could have no party-political allegiance. When they spoke, they would represent only science, speaking in its voice, not, of course, in its interest (Stamm 1981; Osietzki 1984; Carson and Gubser 2002).

With the postwar reinvocation of traditions of self-governance, liberally outfitted as counterweight to the state, the delegation of tasks to nonpartisan bodies took on new ideological meanings (Heffter 1950; Weber [1953] 1967; cf. Hendler 1984; Emde 1991). For the scientists' council, the closest analogues were probably the chambers of commerce, those legacies of liberal self-assurance and self-organization. These familiar associations of upstanding businessmen also served, one assumed, the common good. For public well-being presupposed a flourishing economy; here private and public interest might coincide. The chambers' on-the-ground experience made them central agents of postwar reconstruction, too. They stood in formal consultative relations with the state and put at its service their professedly unideological expertise (Prowe 1987; Schulze 1988; Weise 1989; cf. Plato 1993). Their vocal claims to objectivity, however, existed in tension with their pressure-group function. Was what was good for the businessman really good for the nation? The same questions might be turned against the scientists' council. Appeals for research funding might highlight science for economic growth, but an expansion of support helped scientists first of all.

In practice, matters proved more complicated than Heisenberg had expected. In 1949 he became the first (and last) president of the German Research Council. The two and a half years of its existence provided him with something of a learning experience. The self-evidence of the idea, and the disinterestedness of its proponents, initially seemed to him beyond contest. Yet its proposals did not find unanimous sympathy, and Heisenberg had to explain to himself why. At first he suspected that his opponents were simply following partisan interests, to preserve their own influence or expand their own power (Heisenberg to Otto Bayer, 6 February 1950, in Heisenberg Papers). Over the course of the conflict, however, he slowly came to understand that reasonable people might see things differently. They might prefer other funding mechanisms, endorse other organizational forms, or even disagree that advising was needed at all. Whether or not he accepted the criticisms – in some things he remained stubborn to the point of bull-headedness – he managed at least to grant their legitimacy.

Perhaps the truly scientific response was to acknowledge this openly. The shift had consequences for practical conduct. By 1951, when Heisenberg sent one official a memorandum on a meeting, he enclosed the other side's report, too, in order to provide what he called "a completely objective picture." Synthesis was gone;

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reflexivity took its place. Structural similarities with his physics begin to emerge. And looking back after the council's demise, he could speak openly about his own convictions and their opponents. "It is clear to me," he commented to a colleague, "that many other scholars will have exactly the opposite opinion, and since finding an objective tribunal will not be easy, we will just have to let the two views coexist" (Heisenberg to Theodor Ritterspach, 12 March 1951; Heisenberg to Ludwig Raiser, 6 January 1953, in Heisenberg Papers).

A Scientific Persona

Objectivity still needed authenticating signs. For when skepticism could threaten structural trust in professions, other evidences of impartiality were needed; and if specialized knowledge was only partly accessible, public markers of objectivity remained individual and moralized. One postwar legal handbook on expert witnesses characteristically noted what made for confidence in an expert opinion. Given the situation of judges without expertise of their own, trust had to draw from sources like sobriety of language, abstention from embellishment, and self-limitation to the task at hand. This was a matter of style, but not merely that, for the expert's persona had an intrinsic anchor. What the voice revealed, what it served as a sign for, was the "strength of character" required to maintain the necessary neutrality (Bremer 1963, 20).

Some such markers were shared, others field-specific. For scientists any visual lexicon was limited: the familiar scholarly type (*Gelehrtentyp*), or else the experimenter secreted in his laboratory. Not all actual scientists fit. Heisenberg certainly did not, as discomfited reporters fairly frequently noted. He was not striking by any conventional measure, distinctly less imposing than a Nobel Laureate was supposed to be (e.g., "Heisenberg" 1952; "Werner Heisenberg" 1953). So ironically, but in the end for good reason, Heisenberg's presence, too, came to be borne by his voice. His speech was high in pitch and lacked thunder and resonance, nearly useless for conventional professorial gestures. But lacking other options, this voice – "clear, so completely unpathetic" – gained its weight by speaking just as it did. Heisenberg expressed himself, so one reporter put it, "plainly, to the point, precisely" (Haux 1956; "Atomphysik" 1953). In the public realm, the unobtrusiveness of his self-confidence could give his speech an authority of its own. It left hearers with the reassurance, another commentator felt moved to say, "that every one of his words is governed by the responsibility of the scientist, that for him it is never a matter of brilliant formulation, never of applause, but always and exclusively of the facts of the matter" ("Der Kompaß" 1953; "Die Stimme Heisenbergs" 1953).

Heisenberg had trained himself to speak *as a scientist*; in part he had made himself into a scientist by speaking. His voice was one he had taken on in scientific colloquia, in a day when lecturing proficiency could carry some weight (Cassidy 1992, 141). The voice then came with him when he spoke outside of science. Max Weber had

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demanded that scholars practice self-restraint, leaving the techniques of political oratory at the door of the academic lecture hall. Weber, of course, licensed both modes of discourse. Heisenberg preferred to see the codes of the lecture hall carried outside it (Weber [1919] 1968; Heisenberg 1993). In making points without flourishes, Heisenberg was not simply engaging in modest behavior; the approach also lent to his opinions the weight of a scientist. Deliberately cultivated, his style steered between his audiences' expectations and his own propensities and embodied options.

Interestingly, the verdict of austere renunciation found a certain reworked relevance after 1945. While rhetorical flourishes hardly vanished from public speech, a growing skeptical subculture found them suspect. The turn from National Socialist bombast to sobriety and realism carried into the 1950s and 60s in a variety of channels (Laurien 1991). Before the scientific voice was ceded to its technocratic variant, other, less restrictive options were available. Heisenberg spoke in a manner that held attraction for a young radical like Jürgen Habermas, who solicited the physicist to join in a public statement. Admirers of Theodor Adorno wrote expressing their respect (Carson 1999). Even the literary style of the Group of 47 had something in common with Heisenberg's instantiation of the scientist, "calm, modest, presenting his thoughts without the least pathos" ("Probleme" 1949; cf. Gilcher-Holtey 2000). Facing these audiences, Heisenberg's reception was eased by the slant of his postwar politics. His statements from the 1950s and 60s identified him as a non-party liberal, as his contemporaries plainly understood. The *Vormärz* resonances of the critical scientist made it possible to assimilate him to a broader class of reformist critics, pairing the new generation of literary intellectuals with *bildungsbürgerliche* practitioners of left-liberal *Gelehrtenpolitik*.

In one way, however, a distinction was still marked. More so than the writer, the artist, or even the free-floating intellectual, the scientist's discipline constrained him to retreat from any standpoint. For the individual scientist's voice was not to be located. Weber's prescription to the scholar was to place one's person in the background and repress the desire to put one's predilections on display (Weber [1918] 1968). This marked a distinction that Heisenberg, too, imposed, intent on maintaining a private sphere.[3] In fact, after dozens of pages about the man, one of his contemporary biographers simply gave up: "Personal peculiarities, preferences, individual opinions recede.... As such, the modern atomic scientist is faceless," he concluded (Leithäuser 1957, 92). This reflected the biographer's frustration with this particular individual. Yet Heisenberg the individual lived as he did in part because he chose to live as a scientist.

In some ways he fit the mold best exactly where it was equivocal. Star politics and a fascination with the individual ran counter to the efficacy of the persona. But what

[3] Evidently moved by one inquiry about his favorite poems, he nonetheless gave the characteristic reply: "As a scientist one is not automatically a public personage . . .. it would seem to me presumptuous to put my personal feelings before the public" (Heisenberg to Georg Gerster, 29 May 1953, in Heisenberg Papers).

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drew the public's interest was still one particular, personalized, embodied scientist. The Nobel Laureate knew how to use the attention to get a hearing for his opinions, but he also found the media interest discomfiting. Personally reticent despite his public stature, he could consent to a half-hour television portrait and then spend it glancing down at his hands and backing away from the camera ("Werner Heisenberg" 1968). He was more comfortable on the radio, speaking as a dislocated voice. And in his hands the dialogue as memoir, once the classic genre of self-expression, now served as much to conceal the individual as to reveal him.

Taking Leave of Consensus

Dialogue also had political meanings. As postwar ground rules were bit-by-bit redefined, the late 1950s and the early 60s were a period of muted strain (Schildt and Sywottek 1993; Moeller 1997; Schildt, Siegfried, and Lammers 2000; Schissler 2001). If the Adenauer government presented itself as embodying a national consensus, the political sphere remained distinctly conflicted. The great triumph of Adenauer's center-right camp, after all, was its absolute majority in the elections of 1957 – a popular vote of 50.2 percent, a great success in comparison to Weimar fragmentation, but something less than a universal mandate. Despite a basic anticommunist consensus, in domains like social policy, rearmament, and great-power relations deep divisions remained. Invocations of national unity spoke as much of aspiration as of reality; cracks began to appear in what was believed to be a cultural consensus. Along the way into the 1960s, as the new state's political culture took shape, hope for coherent, definitive resolutions increasingly gave way to acceptance of compromise.

In international affairs, the great-power conflict and the nuclear threat might suggest that political doctrine needed rethinking. Heisenberg, for one, came down for tolerance of coexistence. This was the lesson of the twentieth century; statesmen who believed in clear-cut power politics were stuck back in the nineteenth. Thus in Cold War confrontation, progress could only come through waiving national demands. "Since the justification for a political goal is often judged truly differently by the two sides," he wrote at one point, "there is no alternative to the occasional acceptance of even bitter wrong by the opponent." Then to behave reasonably in politics meant "in following one's own interests, to show more consideration for the interests of others" (Heisenberg, Entwurf, 11 March 1955, in Otto Hahn Papers; Heisenberg to Uta Hahn, 14 October 1958, in Heisenberg Papers). This attitude did not lead to anything-goes. That is, acknowledging others' perspectives did not entail abandoning one's own views; in the global conflict, Heisenberg's anticommunism remained solid. But one's opponents, even the communists, could sometimes be reasonable people. A forum had to be available to those willing to engage in dialogue (Heisenberg to Emilio Meneses, 19 August 1971, in Heisenberg Papers).

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Global confrontation allowed the least hope for concord; foreign affairs had long been imagined a realm of conflict. Within a single state and society, by contrast, politics was supposed to be about the common good. But the polarization of society, and of West German democracy, troubled commentators of the 1950s and 60s. On the one hand their debates grew from a longing to recover a presumed coherence; on the other hand, those same debates tended to underline its decline. Prosperity for all, to cite a famous slogan of the day, was supposed to alleviate class conflict. As the major parties developed away from interest, class, or confessional bases, a principal resource for verbal clashes declined. However, other dividing lines (cultural, political, generational) remained. The nineteenth-century nationalist consensus had presupposed an integrated whole, and ideals of community and solidarity, over and above private well-being, would continue to appeal across the political spectrum. Yet that rhetoric could no longer be deployed so unproblematically, or if it were it could be targeted by skeptics and opponents. Such appeals could seem suspect to critics who mistrusted the effect of obscuring particular interests. At the same time, they were open to question in a society increasingly attentive to its own fragmentation.

And at the juncture between the particular and the general, a chronic controversy flared up once more. By the late 1950s, the power of organized interest groups was again hard to mistake in the parliamentary order. Business and vocational associations lobbied via personal contacts and public relations; the conventional assessment was that their influence was growing. For statist thinkers, interest groups contaminated the neutral realm of governance; for liberals, they exercised influence without popular control; and for the left, by representing private advantage as common good they colonized the public sphere (Weber [1957] 1985; Eschenburg 1955; Habermas [1962] 1989; cf. Berghahn 1986, 199–203; Richter 1999). But the foundation of a democratic order precisely on pluralism – the stance of Westernized political theorists like Ralf Dahrendorf and Kurt Sontheimer – made it impossible to simply write the pressure groups off. By the 1960s, on some parts of the political spectrum, particular interests would need to be rethought in their relation to the whole.

Science as a Vocation

The lesson jolted hardest in one particular domain. Science, and its public support, were to be understood as means to some common welfare. Heisenberg held to the ideal of disinterested service, assuming that scientists could articulate and serve the interest of society. The proper route here was not party-political engagement, but expert advising on a nonpartisan basis. Even if Heisenberg's Research Council failed, he had enough opportunity to put these ideas into practice as one of West Germany's most powerful scientific spokesmen.

With scientists' growing access to the establishment, however, they were themselves drawn into the fray. Because of the demands science made on society's

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resources, polarization could not be suspended where it was concerned. In fact, developments underlined the problematization of political objectivity and, at least in Heisenberg's case, fundamentally complicated the scientist's self-understanding. For Heisenberg the key occasion was the debate of the 1960s over the second generation of postwar accelerator funding. An advisory system he had helped erect provided West German high-energy physicists with practically all the federal money they could spend. By the early 1960s, in fact, most particle physicists were expecting a further expansion of support. But at this moment, new conflicts raised the specter of harder choices: demands of parliamentary committees for executive accountability, financial strains on an economy reaching its limits, and murmurs of discontent from other, less well-funded sciences that raised the possibility of controversy and contention.

Other things being equal, in the 1960s Heisenberg backed projects that opened up interesting experimental domains for modest cost. His sense for interesting domains was shaped by his theoretical predispositions, including the conviction, not shared by most physicists, that his own understanding of the elementary particles would ultimately prove correct. Heisenberg's unified field theory illustrated the consequences of theoretical radicalism pursued in limited interchange with the rest of the community. Although reflexive enough to acknowledge his own view of the theory as "naturally one-sided . . . and not objective" (Heisenberg to Hans Hartmann, 26 September 1961, in Heisenberg Papers), he also believed it was right. Colleagues' sharp-edged comments that he just did not understand why accelerators were needed, however, did not entirely capture his attitude. Heisenberg had been the high-energy community's liaison to their public patrons and had learned greater attentiveness to political and budgetary conflicts. He now asked not only whether money for a huge new accelerator might not be better given to molecular biology, but also whether its value outweighed that of, say, a new university campus or environmental protection.

The structural problem, as it grew through the 60s, was one that Heisenberg finally managed to express in a contemporary vocabulary:

> When an advisory body becomes an interest group as well, at that moment it stops being a useful advisory body. For only completely nonpartisan (*unparteiische*) advising can really be useful to the government. At this point there arises a difficult dilemma. . . . On the one hand it is essential that high-energy specialists be consulted as advisors, since only they can really judge the details. On the other hand, these specialists are necessarily also interested parties. (Heisenberg [1972] 1989, 326)

The difficulty was unavoidable, and Heisenberg did not really have a solution. His recommendation for the interested parties-cum-advisors was a sort of limited self-renunciation. To uphold their obligations, they had to provide politicians what could

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still be called "a completely objective, unvarnished picture." This was one that listed the negatives along with the positives (ibid., 327). That was the best he could do.

Other science policy actors were not ready to put scientific councils on a par with the chambers of commerce (Zierold 1968, 118). Heisenberg at least saw his way to admitting interest groups' democratic legitimacy and acknowledging that scientists fit that role (Heisenberg [1972] 1989, 326). But he also wanted to compel scientists to do more than present their own, self-interested case. What exactly that meant was hard to say. Heisenberg believed he was living the prescription when he spoke out against funding a next-generation proton synchrotron. His colleagues in high-energy physics thought this the indulgence of a highly subjective point of view. Their solution: instead of trying to play the dispassionate observer, they consciously assumed the role of the pitchman. That meant confining public statements to issues on which all participants were known to agree. And in interactions with other actors, such as funding agencies, it meant renouncing the claim to provide anything more than a view of a single branch's needs (Berthold Stech to Heisenberg, 8 April 1970, in Heisenberg Papers; Stellungnahme des Arbeitskreises Kernphysik, 7 July 1967, in Heinz Maier-Leibnitz Papers).

Conclusion

As Heisenberg came to see it, society, like nature, was so constituted that ultimate reconciliation was impossible. The new pluralism of the late 1960s and 70s came to view interest articulation as a legitimate task. The common good, the theory now ran, could *only* be established by balancing particular perspectives. The participants in this dialogue could now be more frankly conceived as interested parties with standpoints (Fröhler and Oberndorfer 1974; cf. McCarthy 1992; Streeck 1994; Mansbridge 1998). In Heisenberg's context, the solution represented a reworking of classical German liberalism in the direction of more distinctly Anglo-American ideas. With objectivity giving way to some sort of intersubjective coordination, it meant a twentieth-century renunciation of certain nineteenth-century convictions.

Still on display, however, were the remnants of a faith in a view from nowhere. All the positives and negatives had to be laid out on the table, but then some balance might be drawn. A magical market-like mechanism could still produce compromise, something that was no longer consensus but still this side of coercion. In that sense, the venture still presumed a nonmetaphysical foundation in a community's shared language or reason. A discursive collectivity could not fragment entirely. So before liberal lapped over into radical pluralism, ending in identity politics or standpoint epistemologies, Heisenberg's terminus remained on this side of the divide.[4] Of

[4] Compare Lukes 1982 or Fraser 1992 with Haraway [1988] 1995.

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course, in politics or in physics, the classical tradition was itself modern; the self-conscious modernism of the twentieth century made it reflexive. Heisenberg was looking to stop before it went further. Whether he could is another question.

What would be the consequences for the scientific persona? As science became an interest group, speaking "as a scientist" came to mean something different. It no longer meant speaking in the universal role, for a consensus beyond contest, but on behalf of a particular group and its needs. Heisenberg tried hard to maintain some weakened version of objectivity by disciplining partiality into a reasoned inter-subjectivity. He held onto his self-understanding as a scientist by making reflexivity part of its code. At the same time, and by the same means, he undercut it in its practical effects. The classical construction of the persona needed to abstract from individuals and locations. When they were acknowledged, its foundations changed.

But for a scientist of Heisenberg's era, the persona may still be a powerful analytical tool. And with the self-abstracting individual at the center of the account (cf. Shortland and Yeo 1996; Caneva 1998), we can see why the different meanings of objectivity might have run in the same direction. Because Heisenberg had some commitment to the notion of the coherent individual, he was inclined to put science and context back together. This took some work and time, particularly in taking his leave of a view of scholarship dissociated from political life. But the desire for coherence in response to fragmentation linked the two through the sensibilities of the individual.

For as Heisenberg came to see it, the changes that generated modern physics could not be severed from transformations in other spheres of life. "It is not by chance," he would recollect about quantum mechanics, "that the development that led to this end no longer took place in a time of belief in progress. After the catastrophe of the First World War one understood outside of scholarship as well that there were no firm foundations for our existence, secure for all time" (Heisenberg [1953] 1984, 389). Ideas of objectivity in science and in human affairs were subject to a shared dynamic. In their early, purist form, their utopian stringency had been mutually reinforcing. But when adjustments seemed needed in one domain, then holding things unchanged elsewhere might become harder. Notions were reworked into more limited shape without being altogether abandoned. When the reining in of ideals was seen as a historical trajectory, more than mere parallelism was at stake.

In the end, objectivity was one of the inherited concepts that Heisenberg no longer had unproblematically at his disposal. Like other legacies from the nineteenth century – space-time trajectories, progress, or political power – the notion seemed in need of rethinking. And because it sat at the center of the scientific persona, tying the validity of scientific knowledge to its fitness for social and political deployment, the re-elevation of standpoint in physics and in human affairs brought with it a reconsideration of the individual's comportment. What could be expected of the scientist? Heisenberg was not the only one asking. His partial rethinking of scientific objectivity responded to challenges to a faith in a view from nowhere: challenges

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technical and social, scientific and political, that he was inclined to see as all of a piece.

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