Holger Nehring

Energy and War

Debates about Nuclear Energy in Early-Cold War West Germany

This essay examines the perceptions of the dangers and possible benefits connected with nuclear energy in early Cold War West Germany. In the Federal Republic of Germany in particular, discussions about the military use of nuclear energy prefigured the tropes which were to resurface in the environmental movements of the 1970s and 1980s. The civilian use of nuclear energy was, by contrast, increasingly seen as the harbinger of peace. This essay seeks to explain the relationship between these two interpretations.

War is all about energy: it is about projecting force, and in order to do this one needs energy. If there is one example for the awesome nature of the energy of war, it must be nuclear weapons. At a weapons test, J. Robert Oppenheimer, one of the scientists involved in the development of atomic weapons, cited a verse from the Bhagavad Gita: 'Now I am become death, the destroyer of worlds.'[1]

At the same time, nuclear energy has, for many, been one of the main drivers of a move towards a no-carbon future and become the panacea to stop global warming.[2] From its discovery and early uses onwards, hopes of enlightenment and progress have been connected with it, and it often led to a veritable "atomic euphoria." As the historian Gabrielle Hecht has demonstrated, the ways in which the dangers stemming from nuclear radiation were defined, differed along national boundaries, even if there were transnational connections.[3] This essay focuses on the West German debates. It highlights how the memories of the destruction of the Second World War and experiences of the Cold War worked together to produce these specifically West German experiences.

This article argues that, rather than seeing these two interpretations – nuclear energy as the root of all problems in the modern world and nuclear energy as the harbinger of peace and prosperity - as diametrically opposed, we should interpret them as two sides of the same fundamental issue: the ambivalences and paradoxes of the problems of technological modernity.[4] The fundamental reason for this ambivalence has been that, while the damages of war can be grasped, the dangers stemming from radiation are invisible to the human eye, unless one uses scientific devices such as Geiger counters. This is why anti-nuclear weapons activists began to use images of the survivors from the American bombings of Hiroshima and Nagasaki as memory icons – but in West Germany, this happened mainly from the 1970s onwards.[5] The period on which this essay focuses, the 1950s and 1960s, still saw its main emphasis on the destruction of material visible objects, such as buildings, rather than destruction through invisible radiation.

The Coming of the 'Atomic Age'

The philosopher Günther Anders discussed more than others what the invisibility of nuclear radiation and the futurity of damages meant for society. "Your first thought after waking up in the morning should be "atom," wrote Anders in a contribution to the *Frankfurter Allgemeine Zeitung* in 1957. "But do not begin the new day with the illusion that this is a stable world. What surrounds you is rather something that tomorrow could be a 'has been."[6] The 1950s appear today as the beginning of an epoch that came to be known as "atomic age." The power of "the atom" became the lead energy at a time when its full importance as well as the understanding of its significance were still in their infancy. The term "atomic age" referred to a set of issues that called up visions of both limitless resources as well as total destruction.[7]

This article aims to historicise these debates. It seeks to show how the debates about nuclear energy and war were at the same time debates about the boundaries of politics and societal imagination – they highlight "what is important for a society and what it strives for; and it is the projection of the image a society develops of itself."[8] In the early-Cold War Federal Republic, debates about nuclear energy and nuclear weapons took place within the framework of experiences of a war of annihilation on the one hand and modernisation and planning for a new future on the other. Debates about nuclear energy and nuclear weapons connected directly to other debates about "modernisation in the period of reconstruction."[9] Well into the 1960s,

reconstruction happened against the backdrop of mass death in war and the human, physical and natural destruction connected with it.[10]

"Peaceful atoms" and their "military abuse"

Immediately after the Second World War, many societies regarded the dangers emanating from nuclear energy as stemming primarily from its military use. The civilian use of nuclear energy for the purposes of electricity power generation was, by contrast, increasingly viewed as the harbinger of peace and prosperity. Some even developed schemes that foresaw the introduction of small nuclear reactors to develop sub-Saharan Africa.[11] Due to West Germany's geographical position on the frontline of the Cold War and its recent experience of utter destruction during World War II, protesters in West Germany, much more than their British counterparts, felt that the dangers coming from the military use of nuclear energy were imminent. They conceptualised these dangers in especially catastrophic terms.[12] For one West German observer, the device became "a horseman of the apocalypse… frightening, incalculable, threatening everyone in the same way, the non-guilty like the perpetrator, the unborn much more than the born."[13] Other papers feared a "world-wide Hiroshima" and calculated damages up to the year 4962.[14]

Throughout the period from the mid-1950s to the early 1960s, a complex interplay between Cold War and Second World War experiences influenced the debates about the dangers of nuclear fall-out and of nuclear weapons in West Germany. The combination of higher perceptions of threat in the Cold War and the catastrophic Second World War experiences led to an especially high salience in the Federal Republic. Here, perceptions of risks coming from both military and civilian uses of nuclear energy often overlapped and cannot be easily separated.[15]

After the Second World War, the destructive powers of nuclear weapons were apparent, but, given the closeness of the World War experiences and despite Hiroshima and Nagasaki, people still perceived the threat of nuclear weapons along rather abstract lines. Only the development and testing of hydrogen bombs by the United States, and, later, by Britain and the Soviet Union, drove the dangers of nuclear energy home to an increasing number of the British and West German populations and led to the first, rather muted, protests in early 1954.[16] To most West Germans, however, an uneasy balance between awe and fear, an admiration of the aesthetics of the atomic

mushrooms and of the power inherent in "the atom," as people perceived it, went side by side. It was perhaps no coincidence that the name, Bikini Atoll, the location of the American tests, was also used for a piece of clothing. Some contemporary West German publications showed women bathing in bikinis side by side with the mushroom clouds.[17]

It was probably one accident more than any other that alerted the West German populations to the dangers of radiation. The Japanese fishing vessel *Lucky Dragon* had sailed into the testing area in the Pacific Ocean on 1 March 1954, leaving its crew severely radiated.[18] It had now become obvious that it was impossible to isolate the dangers of nuclear weapons from its civilian uses and threats from radiation. Nonetheless, many if not most, commentators still upheld the discursive boundaries and talked about an "abuse of atomic energy" for military purposes. What was new in these discussions was that the perceived threat from these weapons was no longer merely connected to the use of the weapons in wartime, but also referred to health hazards in times of peace.[19]

Growing perceptions of the dangers of radioactivity in the air increasingly found expression in worries about radioactive fall-out from the bomb tests in the Pacific reaching Europe and, especially, about Strontium-90 in milk. Strontium-90 is a radioactive isotope that is a by-product of nuclear fission, such as the explosion of a nuclear bomb. By being emitted in the air and then entering the food cycle, it enters produce, and has been found, beginning in the 1950s, to be especially damaging for children. It was particularly in the debates about Strontium-90 in milk that West German society expressed concerns about the future. Pregnant women and new-born babies were singled out as being particularly vulnerable. The growing movements in both countries tried to tap these fears of imperilled nationhood. They alerted the West German populations to dangers from radioactive rain.[20]

Such apocalyptic imagery had important roots in the popular fascination with "the atom" since the beginning of the twentieth century.[21] But it would be too simplistic to draw a direct line from the many apocalyptic voices of the 1920s and 1930s to the discussions of the 1950s and 1960s. Fascination and fear had stood side by side from the beginning of the discussions, although during the 1920s this had mainly been part of a discussion about the dystopian nature of modernity. But the balance between the two shifted. The language which was used from then on, to describe the dangers of nuclear weapons, had first emerged after the Second World War to describe the threats coming from atomic bombs in the late 1940s. From its inception in the late 1940s and

early 1950s, the discourse about the dangers of nuclear energy was connected to its military rather than its civilian uses. In the Federal Republic, the military uses of nuclear energy therefore came to be connected with the memories of the bombings of the Second World War.[22]

This merging of themes of earlier critiques of technology with an acute awareness for the dangers stemming from war is especially obvious in a lecture that the journalist Eckart Heimendahl gave to supporters of the West German anti-nuclear weapons movement on 15 July 1959: "With the bomb, we are threatened by naked violence, rape […], the anonymity, the technical perfection, the automatism." And he connected this existential argument with an exhortation about the dangers of this type of thinking for the survival of democracy in Western Germany during the Cold War: "We have to choose whether we are ready to choose new methods [of protest] before […] the violence takes on other, perhaps equally horrible features like the dictatorial power 'beyond the line' [the wall], which educates slaves and termites, but not human beings, beings endowed with the faculty of free decision."[23]

As memories of the bombing war receded, Robert Jungk, an Austrian journalist who specialised in popularising science, stylised Hiroshima's and Nagasaki's victims as images of the future of atomic warfare. Particularly in West Germany, Jungk's claim that now, in contrast with the Holocaust, no-one could claim ignorance of this "creeping suicide of mankind", resonated strongly.[24] The appeals of the survivor of the National Socialist regime that no one should "survive as accidentally as we did" resonated widely in the West German public. Jungk's *Brighter than a Thousand Suns* also tapped into the West German politics of the past by claiming, wrongly as we now know, that German scientists had not actively worked towards a German nuclear weapon during the National Socialist regime.[25]

All these themes gained in importance in the late 1950s when the issue of dangerous nuclear fall-out was re-connected to the debates about defence policy at the time, specifically whether the West German army should have access to nuclear-capable equipment although it had initially not been permitted to conduct nuclear research, civilian or otherwise.[26]

Scientists played a crucial role in providing the movements and their publics with knowledge. When the American chemist Linus Pauling warned, for example, that "every nuclear test kills" and would lead to genetic defects, this was picked up by both movements.[27] While the manifesto of the Mainau Conference of Nobel Prize winners in the summer of 1955 had been an endeavour without wider repercussions in other countries, the manifesto

issued by the philosopher Bertrand Russell and the physicist Albert Einstein in late 1954 reached a global audience. Apart from the authors, the document was signed by Max Born, Frédéric Joliot-Curie and Linus Pauling, bridging the democratic-communist divide.[28]

All these elements crystallised when eighteen scientists, amongst them many Nobel Prize winners, issued the "Göttingen Manifesto" in April 1957, which criticised chancellor Konrad Adenauer's comparison of nuclear artillery with conventional weapons and sparked the first wide-scale anti-nuclear weapons protests in the Federal Republic. Here, the scientists presented themselves as passive resisters, as a moral voice directed towards immoral politics. With their refusal to cooperate in the development of military nuclear weapons and their parallel endorsement of the peaceful uses of nuclear energy, they suggested that these two areas could be clearly separated. In other statements, they sought to present this as the continuation of the good German tradition that had characterised their actions during the National Socialist regime: unlike their British and American colleagues, they had not been corrupted by working for the government.[29]

The decline of nuclear fear?

Paradoxically, during and after the Cuban Missile Crisis, in October 1962 discussions in both movements about the dangers of nuclear weapons tests became less salient. With the beginning of superpower détente and the Partial Test Ban Treaty, the dangers of nuclear weapons seemed to have been tamed: "the atom" came to be linked less to life-threatening dangers. In West Germany, a new and younger generation of protesters emerged within the movements, so that experiences from the Second World War receded into the background and new issues, such as the Vietnam War, which were not directly connected with the dangers of nuclear energy came to the forefront. However, some older activists, most notably the physicist Karl Bechert and the Munich-based Catholic writer Carl Amery, took the apocalyptic images with them and injected them into the public discourse of the environmental movements of the 1970s and 1980s.[30]

While the debates highlighted the dangers related to the military uses of nuclear energy, most people at the time did not extend their scepticism to the civilian use of "the atom." Most discussions in both countries departed from an analysis of the present as an "atomic age" which commentators regarded as both a threat and a challenge. The Social Democratic Party's (SPD) Campaign

even had a journal called *Atomic Age (Atomzeitalter)*, which served not primarily to warn the population of the dangers of nuclear energy, but to introduce a rational perspective on these matters.[31] The discussions about the peaceful use of nuclear energy thus usually followed the binary code of "curse" and "blessing."

It was against this background that a veritable "atomic euphoria" began to push the fears of nuclear war and radiation from nuclear weapons to the margins of public discussions from the mid-1950s onwards.[32] There was agreement that "the atom" had, for better or for worse, become the hallmark of a new period in human history. The majority in both movements that agreed with the distinction of "peaceful" vs. "military" uses and with the specific conceptions of modernity and progress regarded the peaceful use of nuclear energy as a way to overcome the legacy of the Second World War and the Cold War. This was not merely a product of American propaganda, nor did it push the fear of nuclear weapons aside. It was intimately related to very specific expectations of progress and of the future.[33]

This emphasis on the peaceful uses of atomic energy was linked to the changing Cold War climate of détente. The proponents of this view did not regard arms and military developments as the most important area of battle between East and West, but emphasised the areas of technology and culture instead. The distinction between peaceful and military uses of "the atom" was especially welcome on the political left, as it combined thinking about progress with utopianism. Here, it was connected to the conviction that the future could be designed and planned.[34]

While the military use of nuclear energy would make such planning impossible, its peaceful use would allow planning for a better society. Thus, atomic euphoria in West Germany was particularly pronounced in the SPD, which explains the coexistence of scepticism and enthusiasm about "the atom" in the SPD's Campaign against Atomic Death. Many voices from within the party and the movement regarded nuclear energy as important means to deal with the rapid growth of world population and to enable developing nations' economic progress by allowing them to partake in the energetic potential of "the atom".

The United States was seen as a leader in this field: it had already managed to tame the atom for peaceful uses so that the "future had already begun" there, as Robert Jungk, himself very active in the international anti-nuclear weapons campaigns, observed.[35] This positive image of the "peaceful atom" also had a particular resonance amongst those within the West German

movement and within West German society more generally, who did not agree with the emphasis on planning. Advocating the civilian uses of atomic energy could serve as a symbol for the peaceful intentions of the young Federal Republic. Nuclear energy was, in this context, not merely a source of energy but a symbol for technological developments and opportunities for the nation more generally. While the general public discourses in both countries came, from the 1950s onwards, to be increasingly euphoric about the peaceful uses of nuclear energy, the sceptical and optimistic interpretations continued to sit side by side.

Conclusions and implications: Beyond the 'atomic age'

This interpretation has a number of implications for our understanding of the issue of sustainable energy as well as for the periodization of the development of environmental consciousness. As many historians have demonstrated, it is wrong to assume that that there was a sudden environmental enlightenment in the 1970s that was brought about by the environmental movement. Rather, there was a slow and continuous shift, often encouraged by the government and the state, towards environmental policies.[36]

Nonetheless, they were based on a fundamentally new way of thinking about environmental issues. Over the course of the 1970s and early 1980s, a new system of thinking about historical time and progress emerged, the system of ecology, that now stood next to a "system of progress" that had characterised previous historical periods since the French Revolution. This system had regarded the future as plannable.[37] It implied that there would either be progression and further development, or regression in terms of social and economic backwardness which would follow. This was dependant on technological progress that meant intervening in nature. This solved some problems, but also created new dangers due to its consequences. By the 1970s, the society of the Federal Republic had begun to reflect on these dangers. This was, on the one hand, itself the consequence of planning and expert advice; on the other hand, it reflected the aporias of the current system of progress that assumed that nature could not only be used, but also changed. Yet by the 1970s and 1980s, apocalyptic visions had become part of everyday life, going hand in hand with the realisation that governing nature might also mean destroying it.

This aspect is emphasised by the system of ecology. This system of ecology argues for a different pattern of time and looks beyond planning phases and

election cycles. The key question of politics became how to mediate between the two different prognoses offered by the two systems of thinking.[38] In our current world, the system of ecology has gained almost universal acceptance. Yet even within that system, it is still not clear today how to mediate politically between the different and enormously complex scientific prognoses about environmental damages, that are now even more widely available in our medialised society.[39]

This leads to the second lesson that can be gleaned from this historical case study: given the general awareness of ecological issues, it is remarkable how little salience is now being attached to the risk coming from nuclear weapons. In 2019, during the Easter weekend, the traditional peace movement marches were crowded out by Greta Thunberg and her fellow pupils' protests for sustainability and by the Extinction Rebellion in London.[40] They offer easy fixes. But the military dimensions of nuclear energy have not gone away. We ignore the complexity of this history at our peril.

Notes

1. Richard Rhodes, "'I am become death…' The Agony of J. Robert Oppenheimer," *American Heritage Magazine*, 28 (1977), available at: https://web.archive.org/web/20080612140401/http://www.americanheritage.com/articles/magazine/ah/1977/6/1977_6_70.shtml; the best biography of Oppenheimer is Kai Bird and Martin J. Sherwin, *American Prometheus. The Triumph and Tragedy of J. Robert Oppenheimer* (New York: Knopf, 2005).
2. See one recent example: Hans Blix, "Want to Stop Climate Change? Then It's Time to Fall Back in Love With Nuclear Energy," *TIME*, 11 March 2019, http://time.com/5547063/hans-blix-nuclear-energy-environment/
3. Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge, MA: MIT Press, 2012).
4. This essay reproduces and revisits Holger Nehring, "Cold War, Apocalypse and Peaceful Atoms: Interpretations of Nuclear Energy in the British and West German Anti-Nuclear Weapons Movements, 1955-1964," *Historical Social Research* 29 (2004), 150-170; on the general issue see: *Meanings of Modernity, Britain from the late Victorian Era to World War II*, ed. Martin J. Daunton and Bernhard Rieger (Oxford: Berg, 2001). For a more recent case study see Dolores Augustine, "Learning from War: Media Coverage of the Nuclear Age in the Two Germanies," in *The Nuclear Age in Popular Media: A Transnational History*, 1945–1965, ed. Dick van Lente (Basingstoke: Palgrave, 2012), 79-116.
5. See Benjamin Ziemann, "The Code of Protest: Images of Peace in the West German

Peace Movements, 1945–1990," *Contemporary European History* 17, no. 2 (2008), 237-261.

6. *Frankfurter Allgemeine Zeitung,* 13 July 1957. This reference can also be found in his *Hiroshima ist überall. Tagebuch aus Hiroshima und Nagasaki. Der Briefwechsel mit dem Hiroshima-Piloten Claude Eatherly. Rede über die drei Weltkriege* (Munich: Beck, 1992), 218. On Anders see *The Life and Work of Gunther Anders: Emigre, Iconoclast, Philosopher, Man of Letters, ed. Günter Bischof, Jason Dawsey and Bernhard Fetz* (Innsbruck: Studien-Verlag, 2017).
7. Cf. for example Willy Huhn, "Atomenergie. Friedliche Nutzung oder Mittel der Vernichtung?," *Wir sind jung* 3 (1957), 3-4 and 4 (1957), 2-4.
8. Wolfgang Sachs, "Energie als Weltbild. Ein Kapitel aus der Kulturgeschichte des Produktivismus," *Technik und Gesellschaft*, no. 3/1985, 36-57, here 38.
9. *Modernisierung im Wiederaufbau: Die westdeutsche Gesellschaft der 50er Jahre*, ed. Axel Schildt and Arnold Sywottek (Bonn: Dietz, 1998).
10. Frank Biess, *Republik der Angst. Eine andere Geschichte der Bundesrepublik* (Berlin: Rowohlt, 2019) as well as the case study by diem, "'Everybody Has a Chance'. Civil Defence, Nuclear Angst, and the History of Emotions in Post-war Germany," *German History* 27 (2009), 215-43. On West German history as post-war history see *Nachkrieg in Deutschland,* ed. Klaus Naumann (Hamburg: Hamburger Edition, 2001).
11. Cf., for example, the report on international developments: *Peace Information Bulletin,* vol. II, no. 2 (1964), 2: Institut für Zeitgeschichte, Munich, Christel Küpper collection, ED702/53. For the context see Rusinek, Rusinek, "'Kernenergie, schöner Götterfunken!' For a case study on how the two parameters stood side by side see Ute Hasenöhrl, *Zivilgesellschaft und Protest. Eine Geschichte der Naturschutz- und Umweltbewegung in Bayern 1945–1980* (Göttingen: Vandenhoeck & Ruprecht, 2011).
12. On this deep layer of fear that undergirded German history after 1945 see Michael Geyer, "Cold War Angst. The Case of the West-German Opposition to Rearmament and Nuclear Weapons," in *The Miracle Years. A Cultural History of West Germany, 1949-1969,* ed. Hanna Schissler (Princeton: Princeton University Press, 2001), 376-408 and now the pathbreaking study by Frank Biess, Republik der Angst.
13. "Die tödliche Drohung," *Stuttgarter Zeitung,* 26 October, 1961.
14. "Atomschwaden über Deutschland. SPIEGEL-Gespräch mit dem Strahlenforscher Professor Hermann Holthusen," *Der Spiegel* no. 48 (22 November 1961), 36-41, here 36.
15. See Caitlin E. Murdock, "Public Health in a Radioactive Age: Environmental Pollution, Popular Therapies, and Narratives of Danger in the Federal Republic of Germany, 1949–1970," *Central European History* 52 (2019), 45–64.
16. Holger Nehring, *Politics of Security. The British and West German Protests against Nuclear Weapons* (Oxford: Oxford University Press, 2013), chapter 1.
17. Eckhard Siepmann (comp.), *Bikini. Die fünfziger Jahre. Kalter Krieg und Capri-Sonne. Fotos-Texte-Comics-Analysen* (Reinbek: Rowohlt, 1983). See the image at https://www.booklooker.de/B%C3%BCcher/BIKINI-Die-f%C3%BCnfziger-Jahre-Politik-Alltag-Opposition-Kalter-Krieg-und-Capri-Sonne/id/A024yZzl01ZZS. On the historical background see Albrecht Weisker, "Powered by Emotion? Affektive

Aspekte in der westdeutschen Kernenergiegeschichte zwischen Technikvertrauen und Apokalypseangst," in *Natur und Umweltschutz nach 1945: Konzepte, Konflikte Kompetenzen*, ed. Franz-Josef Brüggemeier and Jens Ivo Engels (Frankfurt: Campus, 2005), 203–221.

18. Carola Sachse, "The Max Planck Society and Pugwash during the Cold War: An Uneasy Relationship," *Journal of Cold War Studies* 20 (2018), 170-209. On the transnational dimensions see Alison Kraft, "Dissenting Scientists in Early Cold War Britain: The 'Fallout' Controversy and the Origins of Pugwash, 1954–1957," *Journal of Cold War Studies* 20 (2018), 58-100.
19. Ilona Stölken-Fitschen, *Atombombe und Geistesgeschichte. Eine Studie der fünfziger Jahre aus deutscher Sicht* (Baden-Baden: Nomos, 1995) which has inspired the discursive approach taken here.
20. For examples see Murdock, "Public Health in a Radioactive Age," 51-53.
21. Cf. the conceptual argument for Britain by Kirk Willis, "The Origins of British Nuclear Culture, 1895-1939," *Journal of British Studies* 34 (1995), 59-89 as well as Jonathan Hogg and Christoph Laucht, "Introduction: British Nuclear Culture," *British Journal for the History of Science* 45 (2012), 479-493.
22. Cf. the detailed argument in my *Politics of Security.*
23. Eckart Heimendahl, Resignation vor den Atomwaffen? Die Drohung der Bombe lähmt unser Denken (Vortrag am 15.7.59): Archiv der sozialen Demokratie (AdsD), Ansgar Skriver papers, 1/ASAF000177.
24. Robert Jungk, *Strahlen aus der Asche. Hiroshima und die Folgen, with a preface by Matthias Greffrath* (Munich: Heyne, 1990) [1959], 317.
25. Robert Jungk, *Heller als Tausend Sonnen. Das Schicksal der Atomforscher* (Stuttgart: Schertz und Goverts, 1956); English edition: *Brighter than a Thousand Suns: A Personal History of the Atomic Scientists* (Boston and New York: Houghton Mifflin Harcourt, 1958). 1956); Mark Walker, "Legenden um die deutsche Atombombe," *Vierteljahrshefte für Zeitgeschichte* 38 (1990), 45-74; Gabriele Metzler, *Internationale Wissenschaft und nationale Kultur. Deutsche Physiker in der internationalen Community 1900-1960* (Göttingen: Vandenhoeck & Ruprecht, 2000), 196-198.
26. Mark Cioc, *Pax Atomica: The Nuclear Defense Debate in West Germany during the Adenauer Era* (New York: Columbia University Press, 1988).
27. Linus Pauling, "A Nobel scientist speaks: Every test kills..." *Liberation. An Independent Monthly* (New York) 2, no. 11 (February 1958), cited after Jack D. Dunitz, "Linus Carl Pauling. 28 February 1901-19 August 1994," *Biographical Memoirs of Fellows of the Royal Society* 42 (November 1996), 316-338, here 335.
28. Cf. Alison Kraft, Holger Nehring, and Carola Sachse, "The Pugwash Conferences and the Global Cold War: Scientists, Transnational Networks, and the Complexity of Nuclear Histories," *Journal of Cold War Studie*s 20 (2018), 4-30; for West German reactions, cf. Stölken-Fitschen, *Atombombe und Geistesgeschichte*, 109-116, 131-136, 248-254.
29. Stölken-Fitschen, *Atombombe und Geistesgeschichte*, 214. On the importance of experts for the debates in the 1950s and 1960s see Albrecht Weisker, "Expertenvertrauen gegen Zukunftsangst. Zur Risikowahrnehmung der Kernenergie,"

Vertrauen. Historische Annäherungen, ed. Ute Frevert (Göttingen: Vandenhoeck & Ruprecht, 2003), 394-421.

30. On Amery cf. the interview in *The Culture of German Environmentalism: Anxieties, Visions, Realities, ed. Axel Goodbody* (New York and Oxford: Berghahn, 2002), chapter 8.
31. On the history of the journal under the editorship of Claus Koch, cf. AdsD, IG-Metall Archives: G1010; as well as Claus Koch to Georg Breuer, 11 December 196: AdsD PVAM000012.
32. Bernd-A. Rusinek, "'Kernenergie, schöner Götterfunken!' Die 'umgekehrte Demontage'. Zur Kontextgeschichte der Atomeuphorie," *Kultur & Technik 4* (1993), 15-21.
33. This interpretation goes back to Eisenhower's "Atoms for Peace" speech in 1955. Cf. Ira Chernus, *Eisenhower's Atoms for Peace* (College Station, TX: Texas A& M University Press, 2002); Ulrike Wunderle, *Experten im Kalten Krieg. Kriegserfahrungen und Friedenskonzeptionen US-amerikanischer Kernphysiker 1920-1963* (Paderborn: Schöningh, 2015).
34. Lucian Hölscher, *Die Entdeckung der Zukunft* (Frankfurt: Fischer, 1999), 174-197 and 219-223; Elke Seefried, *Zukünfte: Aufstieg und Krise der Zukunftsforschung 1945–1980* (Berlin: de Gruyter, 2015).
35. Robert Jungk, *Die Zukunft hat schon begonnen. Amerikas Allmacht und Ohnmacht* (Stuttgart and Hamburg: Heyne, 8th ed., 1953) [1952], 20.
36. Jens-Ivo Engels, *Naturpolitik in der Bundesrepublik. Ideenwelt und politische Verhaltensstile in Naturschutz und Umweltbewegung 1950-1980* (Paderborn: Schöningh, 2005); Franz-Josef Brüggemeier, *Tschernobyl, 26. April 1986. Die ökologische Herausforderung* (Munich, 1998), 211-212; for the broader periodisation see Joachim Radkau, *Nature and Power. A Global History of the Environment* (New York: Cambridge University Press, 2008). For a similar argument see Murdock, "Public Health in a Radioactive Age".
37. For details on this shift see Holger Nehring, "Genealogies of the Ecological Moment: Planning, Complexity and the Emergence of 'the Environment' as Politics in West Germany, 1949-1982," in *Nature's End: History and the Environment*, ed. Sverker Sörlin and Paul Warde (Basingstoke: Palgrave, 2009), 115-138.
38. This argument follows Reinhart Koselleck, "Allgemeine und Sonderinteressen der Bürger in der umweltpolitischen Auseinandersetzung," in *idem, Begriffsgeschichten* (Frankfurt: Suhrkamp, 2006), 516-526.
39. Cf. also Niklas Luhmann, *Ökologische Kommunikation* (Opladen: Westdeutscher Verlag, 1986).
40. Cf., for example, https://www.theguardian.com/environment/2019/apr/21/extinction-rebellion-london-protesters-offer-pause-climate-action.