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Editor's note

In this issue, Mats Fridlund and Lissa Roberts, in their respective articles, take up a central problem in recent historiography and discussions of historical explanation: the interplay of materiality, the articulation of social and political space, and the constitution of individual experience. Each article seeks to make strong historical and methodological claims. In Fridlund's narrative, it is to bring forward 'subjectivity' as a problem, using the history of terrorism as his interpretive lens. The sociocultural effects are his focus; he considers historical actors in the everyday world and their encounter with terrorism-related objects and discourse about these objects in particular places and times – early nineteenth century Copenhagen, London in the interwar years, and the United States after World War II, and, respectively, to each case, associated objects such as buckets; warning sirens and gas masks; and, then, bomb shelters and bollards. Roberts, covering a related set of historiographic issues, highlights the notion of 'geographies' in understanding the movement of steam technologies and entrepreneurs in France, and within a broader European context, during the second half of the eighteenth century. The use of the plural 'geographies' is to suggest a process of contestation between established and emerging social orders and of the varying scale of such contestation that shifts along local, regional, and transnational trajectories. Space, thus, she argues is not passive but an organizing constituent of historical experience.

Readers of this journal will recall that the themes of materiality and spatiality engaged by Fridlund and Roberts have been the subject of two book forums: Christopher Otter's *The Victorian Eye: A Political History of Light and Vision in Britain, 1800–1910* (vol. 26, no. 2, 2010) and Chandra Mukerji's *Impossible Engineering: Technology and Territoriality on the Canal du Midi* (vol. 27, no. 2, 2011). And Fridlund's concern with subjectivity, technology, and everyday experience was, in a different context, the subject of the forum on Cotten Seiler's *Republic of Drivers: A Cultural History of Automobility in America* (vol. 26, no. 4, 2010). These forums and this issue's articles might usefully be read in conjunction.

The themes of materiality and technology also inform the essays in this issue's 'Images, Technology, and History' feature. Laura Anne Kalba, in 'How Media Were Made: Chromolithography in *Belle Époque* France' focuses on the advent of machine techniques for producing color images and the resultant effusion of consumer-oriented, visually vibrant ephemera, arguing that this activity became a crucial site for negotiating among aesthetic values, commercial culture, and technical versus craft methods. In 'Detachment, Death, and Destruction in Gerhard Richter's *Strontium* (2004),' Kristian H. Nielsen analyzes artist Richter's attention to technology as a foundational element of the post-World War II experience.

Martin Collins
Smithsonian Institution

Buckets, bollards and bombs: towards subject histories of technologies and terrors

Mats Fridlund*

This article provides a theoretical and empirical contribution to the political history of technology by articulating a new conceptual perspective on the power of technological things and through outlining a history of modern urban technological terror and terrorism. It introduces a user-centered perspective on technological politics in the form of 'subject histories of technology' which, contrasting with prevalent 'object histories of technology' on technological inventions and innovators, emphasize the self-fashioning power of technological artifacts. Through an overview history of technology of 'terror-mindedness' covering the three subsequent waves of urban terror arising from aerial bombardment, nuclear weapons and substate terrorism it shows how technologies have been used by individual citizens to cope with the experience of man-made fear and insecurity. In conclusion it argues that the political history of technology should to the focus on community politics and system politics of big institutional technologies add an attention to the personal politics of the emotional and material power of small technical things.

Keywords: technology of terrorism; technology in use; history of emotions; subjectivity; politics of technology; history of terrorism

They were aiming for the towers. From across the sea they had come, a handful of civilians with their new missiles to wage war against the mighty military power. By attacking its greatest city and its towering symbols of pride and of power over men, they hoped to break the morale of the city and the nation and to force their humiliation. Their aim was true. Through the September sky the missile flew piercing the high tower that soon was burning. It was beyond the firemen's ability to save it and the tower, once among the highest in the world, fell down and was no more. Screams of terror and panic rose up from the citizens while shouts of glee and jubilation greeted it from their watching enemies. Urban terror, more advanced than ever before, had entered the world. Its impact was going to shape the city and the nation, and change the political map of the world.

This event in the history of technology of terror was 'The Bombardment of Copenhagen,' inflicted by British troops, 2–5 September 1807, and which has been described as a precursor of the urban terror attacks of 11 September 2001. The immediate cause of the Bombardment was British fears during the Napoleonic wars that Denmark would support France. To thwart that possibility, the British told the Danes to give up their mighty navy as security for the country's continued neutrality. When Denmark refused, the British besieged Copenhagen. During three nights they bombarded the city with thousands of bombs and rockets, leading to its surrender and the loss of the Danish navy to the British. The attack pushed Denmark onto Napoleon's side and following his defeat the country

*Mats Fridlund is a Professor in the Department of Philosophy, Linguistics, & Theory of Science, University of Gothenburg, Sweden, and an Associate Researcher at Center for Advanced Security Theory, University of Copenhagen, Denmark. Email: mats.fridlund@gu.se

had to cede Norway to Sweden and Denmark was transformed 'from an outward-looking international actor to an inward-looking, nationalistic operetta-state.'[1]

The urban terror attacks of 1807 and 2001 share significant traits despite being separated by almost two centuries. These commonalities will here be used in an overview history of urban man-made terror to introduce a novel approach to the politics of things. As such, this study is not meant to be read primarily as a historical case study of the defensive–offensive interaction of security and terror technologies or a history particular to military technologies. The ambition is more general and conceptual, to provide a methodological object lesson in how history of technology can contribute to a new more intimate political history. This history is of the *subject politics of technology* which focuses more on technical things' visceral experiential effects on human subjects rather than the symbolic discursive meanings of technological objects.

In the following we will first briefly return to the Bombardment of Copenhagen and two short histories of technology of urban terror which illustrate two contrasting historical perspectives on the politics of things. This is followed by a discussion of how I see the subject politics of technology as differing from the previous dominant approaches to technologies of power within history of technology. Subsequently, the qualities of the subject history approach will be exemplified through a technological history of 'terror-mindedness' during the twentieth and twenty-first centuries. The conclusion will outline some of the main implications of this perspective for both the history of terrorism and the history of technology.

An object history of technology and terror: Congreve's rocket

As a historical phenomenon 'terror' has been both a material technology and an embodied experience. The first short history of technology of urban terror presented here is about *innovation* of new radical technologies of terror. It focuses on the meaning of terror, as 'a *cause* of intense fear or anxiety' in the form of an object, a material thing, or practice which creates terror, terrorizes, and terrifies. In such an object history of technology of urban terror, the meaning of terror is the same as when something is a 'terror weapon' and 'terror to evildoers' or when warriors such as Alessandro del Borro or Lawrence of Arabia were described as 'the terror of the Turks.'[2]

In each case, in 1807 as well as 2001, the terror attacks were seen as launching a new technology of terror on the world scene and the use of man-made terror against urban citizens of a previously unprecedented scale and scope. The Bombardment of Copenhagen has been described as the 'first terror bombardment against a civilian population in history.'[3] Whether it deserves that dubious recognition is debatable but what is clear is that it does exemplify a new development in the history of man-made terror, as the targeting of urban civilians in Copenhagen was more systematic than previously and of an unprecedented magnitude and intensity. In their bombardment the British deliberately targeted civilian areas, in particular they aimed for Copenhagen's church towers as they assumed this 'could break down the morale in the city' and force a surrender without need of storming the city. This strategy worked. Moreover, the 200 or so civilians killed per day during the attack were 10 times more than in previous military bombardments of European cities. This deliberate attacking of civilians also received international attention and condemnation.[4]

This new urban terror, too, was more 'advanced' in the sense that it was partly accomplished through a new 'scientific' terror weapon, as of the around 14,000 missiles launched at Copenhagen some 300 were 'Congreve rockets' loaded with explosive or incendiary material.[5] Like the kamikaze 'human cruise missile' used on 9/11,[6] this

innovation of terror technology originated from an Asian military tactic that had proven its worth against Western military forces before its adoption against Western civilians.[7] The new rocket was based on an Indian technology used with great effect against the British in the eighteenth century, which led the British inventor William Congreve (1772–1828) to appropriate the weapon of subjugated colonials and through a systematic research and development (R&D) program at the laboratory of the Royal Arsenal at Woolwich transform it into a tool of the British Empire. In Copenhagen, the rockets, which had been developed to carry incendiaries and to stick to buildings, were operated by a group of civilian specialists who succeeded in burning down one of the highest cathedrals in the world, Vor Frue Kirke, and to effect the city's unconditional surrender. Congreve's new missile was later used in 1814 against former colonial subjects, in the battles of Bladensburg and Baltimore in the USA. In the former instance, the rockets contributed to the burning of Washington, including the White House and the Capitol, and in the second it inspired a line in the US national anthem.[8] Following the British, several European nations and the USA set up rocket corps until surpassed by artillery developments later in the century. The rocket was reintroduced as a terror weapon during the twentieth century with the German V-2 and the nuclear ICBMs, and in today's society rockets are still in use as terror weapons by states and non-state groups alike.

Histories like this, 'creation myths' of pioneering path-breakers, radical innovation and revolutionary change, have been told countless times within the history of technology and the history of terrorism. Such themes are less evident in the second history of terror, which is about buckets and the power of mundane technologies.

Subject histories of technologies and terrors: bombs and buckets

In this second history of technology 'terror' primarily stands for a subjective experience, 'an intense fear or anxiety,' rather than a material object and the material technologies in its center were used to cope with the terror rather than to cause it. This history's primary concern is not threatening terror technology, nor the warriors, engineers, or radicals effecting terror, but those civilians primarily suffering it and the influence that technologies had on their experience. This history of technology is about the power and experience of technology, on the use and abuse of technologically mediated violence on urban citizens and on how mundane material things and bodies become enlisted as tools to combat the new man-made terror. Urban terror here provides an example of a *subject history of technology* whose primary topic is not so much the sociotechnical shaping of a technological object or its designers, innovators and system builders but rather focuses on humans as subjects of the effects and power of technologies and their personal experience of technology in use.[9]

This history about the technologically mediated *experience* of terror takes as its starting point another similarity between the Bombardment and 9/11: that in historical representations of the two events the central actors tend to be those humans subjected to the terror rather than its objects.

In Copenhagen, firemen and civilian volunteers stood for many successful as well as fatal heroics during the Bombardment.[10] In addition to the ordinary fire brigade, some 4000 voluntary firemen were marshaled. Things, too, were enrolled to help the city manage the expected bombardment. In addition to the fire brigades' hoses, wagons, and fire engines, each city block had its own technologies that were used to help citizens cope with the terror, including special fire lights, hoses, buckets and badges.[11] (See Figures 1–2.) The authorities tried to create a sense of security through publication in

M. Fridlund

Figure 1   Figure 2

Figures 1–2.   Technologies of urban terror. The two towers being attacked by rockets and bombs are the Trinitias Church (left) and the burning Vor Frue Kirke in the distance. Notice the emphasis of terrified human and animal subjects in the engraving *Fire of the Tower of Our Lady* (1807) based on a drawing by an eyewitness. Fire warden's badge and fire bucket used by citizens of nineteenth century Copenhagen. Courtesy of the Royal Library, Denmark & the author.

Copenhagen's main daily newspaper of a prescription on how to better cope with the coming bombardment, enlisting besieged citizens and their material resources:

> Attentiveness and Initiative are powerful Means to suppress damaging Consequences of the down falling Bombs' Effect in Case of Bombardment. Inhabitants of the City! Leave therefore not Your Yards and Houses, as during the first Moments we can achieve a lot. One should only notice the Place where a Bomb falls. Flee such a Place as far as possible from one Room into another, and wait calmly the Time it takes, but once it has sprung, which is easily noticed: then rush ahead with a Bucket of water, and one will then with a few splashes of water extinguish and preempt Outbreak of Fire, that otherwise could catch and spread Wide, and then suppressed with difficulty. One would expose oneself to Danger, if one had the Idea, that one would extinguish a Bomb with whatever Means. Avoid therefore the Place until the smoke Stops. If one is in an open Place, where a Bomb falls down then one throws oneself flatly to the Ground and tries to push oneself a distance away from it. One has water on all floors and water supply in the Yard![12]

From contemporary accounts, we know that these mundane materialities helped citizens to cope with the attack. A merchant wrote of how on the first night of the

bombardment his wife had extinguished seven bombs, 'some of them with the Help of the Firemen, but . . . she herself with her Servants had extinguished the rest, after she got to learn the Practice.'[13] 'Coping' was not accomplished only by mobilizing materialities, however; the mentalities of the inhabitants were also enrolled. The same newspaper published another instructional notice:

> Prayer to God in Jesus' Name during the attack by the English on Copenhagen: for home Use by anyone that wants to, by the Bishop of Zealand Dr Nicolai Edinger Balle, can be picked up for free from Mrs. Gyldendal at Klareboderne No. 9.[14]

Survivors reported that Bishop Balle's prayer had been used by terrified citizens during the bombardment. Nonetheless, these material and mental coping mechanisms were not sufficient for everyone to withstand the terror of bombs and rockets. The attack was apparently so intense that several people were reported to have died 'out of horror.'[15]

The power and politics of things: the technological shaping of communities, systems and subjects

Like the history of Congreve's advanced rocket, Copenhagen's mundane bucket is also a history of technology of terror. This history of technology is more about resilience and continuity than about innovation and change, and the material politics of citizens and users rather than that of engineers and inventors, and of the technological self-fashioning of subjects rather than the design of technological objects.

This perspective has been largely missing from the history of political technologies, which for more than a quarter century has been shaped by the two seminal monographs, Ruth Schwartz Cowan's *More Work For Mother* (1983) and Thomas Parke Hughes's *Networks of Power* (1983), each, respectively, inspiring studies on technology as 'community politics' and 'system politics.' Technology as community politics points to work focusing on the power of technology on a social level, as representing or shaping the collective identities and ideals of communities as exemplified by histories of technology, labor, and gender. Technology as system politics refers to studies on an institutional and large-scale level – often regional or national – in the form of the (big) politics of 'large technical systems' and other explicitly political technologies like infrastructural and military technologies. These political histories have, for the most part, been in the form of 'object histories of technology,' histories about design, innovation, and manufacturing of technologies and of individuals and institutions creating, manufacturing and operating (new) technological objects such as machines, devices and systems.[16]

Marginalized in this political history of technology is a concern with technology as a form of *subject politics*, the power and consequences of technology on an individual level. This deals with the power of technological things to through their use change history on a personal level, the visceral agency of mundane artifacts to make people feel, experience and relate to their worlds and their selves differently. Although this is a history of technology of use it differs from most recent research on the agency of users and of things. Users have been a focus in history and sociology of technology since the seminal articles by Trevor Pinch and Wiebe Bijker on the social construction of technology, Ruth Schwartz Cowan on the consumption junction, and Bruno Latour on door handles and hotel keys.[17] The central difference is that this research has primarily not engaged with the power of technologies on users' subjective selves, on technological use as *shaping subjectivity*. Instead it has focused on use as *shaping technology* through illuminating

object histories of active users as technological co-designers, innovators and adapters or on passive consumers as silent recipients or faceless targets of the embodied scripts and values machined by corporate designers, managers and advertisers, as revealed through decoding of the discourse of public technological representations such as advertisements, handbooks, speeches and policy documents.

Another research trajectory tangential to technology as subject politics is that on various forms of artifactual agency, what has sometimes been described as the 'return to things' and represented by work on 'thing studies,' materiality, and 'new material culture.'[18] However, despite pronouncements about reengaging with material agency and denouncements against 'reading things' like just another text instead of engaging with the 'thingness' of things,[19] this research to a large degree reinscribes a semiotic position. Rather than focusing on technical things' role in intimate transformations of self or individuals' experience of technologies' subjective affects, such studies has emphasized detached decodings and assignments of symbolic collective meanings of technologies as cultural representations and congealed social power or analysis of technologies as mediators for institutional and communal change.[20]

What historical research there is on technological subject-shaping primarily follows the groundbreaking works of Wolfgang Schivelbusch and Michel Foucault. Schivelbusch was a pioneer of subject-oriented history of technology through his studies of the subjective experience of the railway and its shaping of the 'industrial subject' and the industrialization of consciousness.[21] Foucault's influence is through his work on governmentality, *dispositif* (apparatus), and technologies of power and technologies of the self. Yet, despite his status as theoretician of materiality, Foucault does not dwell on the actual materiality of technology. With the exception of the iconic example of the Panopticon as a (never realized) material technology of power, his work primarily addresses immaterial institutional and individual techniques of disciplinary power.[22] Notable historically minded followers of Schivelbusch and Foucault include Jonathan Crary, Chris Otter, Cotton Seiler, On Barak, Adam Max Cohen, and Peter Adey,[23] and their work, broadly, can be characterized as intellectual history or 'cultural history from above' in that it primarily examines the technological shaping of subjects by cultural elites and commercial institutions. Moreover, such studies have not focused on users' subjective technological experience but have been primarily limited to studying prescriptive discourses such as advertisements, scientific and political re/presentations and how they have attempted to assign various subject-positions to imagined users.[24] Additional important scholarship on technological subject-making are works by David Nye, Jan Garnert, Claude Fischer, and Rebecca Herzig.[25] There is also research on subjectivity within Science and Technology Studies (STS), broadly construed, in the study of 'subject-networks' and 'sociology of attachments' within actor network theory (ANT), on medical technologies' impact on bodies and selves, and on cybertechnologies impact on perceptions of selves.[26] Also, significant for this discussion is work by anthropologist Daniel Miller on the consequences of materiality and on 'how the things that people make, make people,'[27] as exemplified by a study of the sari 'as a *lived* garment' and 'the importance of clothing as feeling and social experience.'[28]

The history of terrormindedness: how we learned to live with the bombs

The potential of subjective history of technology is offered here through a history of the development of urban *terrormindedness*. The affect of man-made terror in the form of feelings of fear and of security from death and destruction from terror technologies is

studied on the level of the individual: how it becomes incorporated into everyday urban experience as individual habitus, domesticated and inculcated into citizens' mentalities and behaviors through the use of various 'coping mechanisms' in the form of personalized practices and mundane technologies, such as prayers and fire buckets.[29]

From the twentieth century on this history can be divided into three consecutive waves characterized by, respectively, the threat of aerial attack, nuclear war, and terrorist bombings, and their associated coping mechanisms in the form of technical things such as bombshelters, Geiger counters, and closed-circuit television cameras, as well as social routines such as duck-and-cover drills and public announcements not to leave bags and luggage unattended. Although forms of terror changed over time there is a case to be made for emphasizing continuity over change as each added layers to, rather than replaced, a longer, interconnected history stretching more than a century. It is, thus, a *longue durée* history of living with urban terror, adapting to this circumstance through technologically induced behavior, a technological *mentalité*, a resilient pattern in our material and mental responses towards terror as individuals and as collectives, as citizens and as cities.[30]

Despite the local terror caused by the bombs and rockets of Copenhagen, the breakthrough to widespread urban terrormindedness as a phenomenon came in the twentieth century when the meaning of being 'urban' changed to include being 'subjected to the industrialized instruments of destruction.' The first wave of change centered on new aviation technology and the development of 'airmindedness,' a term coined in the early 1900s for an aspired-for consciousness embracing the civilian and military possibilities brought forth by aviation.[31] Military aviation helped create a habitus in which urban dwellers had to adapt to a life with the aerial threats to cities. This was the first instance of widespread terrormindedness. Urban citizens resisted and reified, lived with and died from aerial attack, a condition which set the pattern for consecutive man-made urban terrors and for how urban citizens learned to live with bombs as a part of their daily lives. With the advent of nuclear weapons, airmindedness entered a new stage and transformed into the perceived perils and promises of Cold War *nuclearmindedness*. After the relative decline of the nuclear threat in the 1990s, terrorist attacks received widespread recognition as the new predominant man-made urban terror threat and *terrorism-mindedness* rise to prominence in the planning and practices of urban individuals and institutions. These respective eras are the focus here, emphasizing, as argued above, a cultural history of technology of urban terror, placing anticipation rather than actual realization in the foreground, a technological history where the sources are people's experiences of their imagined futures.

In addition to being an object lesson about how things are not just good to think with but also to feel with, this narrative provides a perspective from history of technology on contemporary society's struggle over how to live with the terror of bombs. Throughout modern history, political discourse and practices centered on state terror and terrorism have been critical structuring mechanisms of political power, and the response to terrorisms, in the past as well as in the present, has been intimately connected to technological developments – as demonstrated by current debates on the threats to society from cyberterrorism and weapons of mass destruction and to personal privacy and political rights from airport security systems and surveillance technologies. Despite contributions from scholars such as Carl Smith, Michael Sherry, and Donald MacKenzie situating the technological shaping of previous man-made urban terrors,[32] historians of technology have so far, with a few exceptions, shied away from historicizing the contemporary 'war on terror,'[33] perhaps because of concerns that such studies could serve the agendas of extremists or governments.[34] This is a dilemma that scholars studying the mechanisms and machinations of violent politics have always lived with, and always will.

Airmindedness: hopes and fears of death and destruction from above

The Bombardment of Copenhagen reminds us that it was not new that cities could be sacked, but what was new to the twentieth century was its speed and immediacy. Now without warning 'the airplane could appear instantaneously, drop its charge, and depart, an anonymous anarchist bomber of the sky.'[35] The new urban threat of death and destruction from above was partly created through popular prophesies like H.G. Wells' *The War in the Air* (1908), and during World War I urban mentalities were airminded already before bombs even had started to fall. A diary entry from London in 1915 provides a snapshot of the emerging urban habitus:

> In St. James Street there was a terrific explosion; people came running out of Clubs; stopped still & gazed about them. But there was no Zeppelin or aeroplane – only, I suppose, a very large tyre burst. *But it is really an instinct with me, & most people*, I suppose, to turn any sudden noise, or dark object in the sky into an explosion, or a German aeroplane.[36] (Emphasis added)

And Londoners' fear soon turned material. During World War I aerial bombs killed more than 2000 people and caused damages in excess of £2 million. These 'material' effects were, however, considered secondary by several commentators with the mental effect deemed much more important.[37] British war reports spoke of lowered productivity 'due to workers' loss of sleep, growing anxiety among the residents of bombed cities, and panicked crowds in the streets of London.' This would help 'lock in' a contentious and denied military strategy of targeting civilian morale 'by physical bombs and by the psychological threats of bombs.' Postwar air war advocates stressed these mental effects on urban populations and, echoing their foremost 'prophet,' Italian strategist Giulio Douhet, saw future war as 'a contest of nerves and social discipline' and civilians as 'not only the primary targets of air war but the most important combatants, responsible for maintaining social order, [and] bolstering national morale.'[38] In the interwar period the new strategy combined, in urban minds, with another recent military development – poison gas – to intensify the sense of threat.

Interwar historians of technology were complicit in creating the threatening dimensions of airmindedness. In 1938, Lewis Mumford, published *The Culture of Cities*, appearing four years after *Technics and Civilization*. He described the two books as complementary as 'each seeks to explore what the modern world may hold for mankind once men of good will have learned to subdue the barbarous mechanisms and the mechanized barbarisms that now threaten the very existence of civilization.' Mumford described large cities as key sites of fear and of imperialist political manipulations and the 'metropolis' as 'the focus of these war forces,' which represented 'the maximum possible assault upon the processes of civilization.'[39] Mumford saw how the machinations typical of capital cities affected the mentalities of not just their own inhabitants but also of nations and how 'peace' during the interwar period was 'equally a state of war: the passive war of war-propaganda, war-indoctrination, war-rehearsal: a preliminary maneuvering for position' and how the political center's 'systematic barbarism spreads like a cancer through the healthy tissue of urban life: the war capital, through its organs of indoctrination, makes every subordinate province war-minded.'[40] Urban citizens were made warminded through the staged preparations of defense of the city against air attacks, which periodically 'skillfully' evoked the 'materialization' of one of the foremost urban terrors:

> The sirens sound. School-children, factory hands, housewives, office workers, one and all don their gas masks. Whirring planes overhead lay down a blanket of protective smoke.

> Cellars open to receive their refugees. Red Cross stations to succor the stricken and the wounded are opened at shelters: underground vaults yawn to receive the gold and securities of the banks: masked men in asbestos suits attempt to gather up the fallen incendiary bombs. Presently the anti-aircraft guns sputter. Fear vomits: poison crawls through the pores. Whether the attack is arranged or real, it produces similar psychological effects. Plainly, terrors more devastating and demoralizing than any known in the ancient jungle or cave have been re-introduced into modern urban existence. Panting, choking, spluttering, cringing, hating, the dweller in Megalopolis dies, by anticipation, a thousand deaths. *Fear is thus fixed into routine: the constant anxiety over war produces by itself a collective psychosis* comparable to that which active warfare might develop. Waves of fear and hatred rise in the metropolis and spread by means of the newspaper and the newsreel and the radio program to the most distant provinces.[41] (Emphasis added)

With Mumford's skillfully evoked nightmare, it can be argued that it was not only destructive materialities like bombers, bombs and gas that shaped the new air age but also more mundane technologies defending the urban citizens against the air attacks such as sirens, improvised shelters, and gas masks.[42]

As historian Peter Fritzsche has argued, in interwar Germany air defense evolved into 'an ambitious program of national renovation' to rearm the country and 'discipline the nervous energy and political passions of its citizens' with urban air defense routines entangling civilians 'in a web of discipline and authority.' Shortly after Hitler's chancellor appointment air-defense officials accused democracy of dissolving 'the social bonds necessary for national defense' and that Germans should 'accept the primacy of the state that mobilized society in the name of national security.' Summed up by the air-defense slogan '*One People, One Danger, One Defense*.' The Nazi-founded Reich Air Defense League (*Reichsluftschutzbund*) turned cityscapes into street exhibits of aestheticized terror bombings adorning city squares with huge incendiary bombs and dummy bombs hanging 'from street lamps and streetcar wires, ominous, dangling reminders of the proximity of the air war.' Almost all urban citizens participated in air-defense work and had their civic and civil 'vigilance' surveyed by some 350,000 block wardens. Air defense exercises like those described by Mumford became widespread 'routine events' and facts of 'daily life' of the interwar city.[43]

Terrormindedness was not just collective and public, it was also private and personal as illustrated by the iconic technology of airmindedness: the *gas mask*. According to Fritzsche's description of German airmindedness, no other technology better stood out and stood in for civilian terror, better identified those 'individuals who had mastered the challenges and accepted the opportunities of the air age' and like no other single thing recalled 'the horror of living in the air age with the same quotidian insistence.' The interwar period saw the gas mask transformed from a military and specialist tool to an ubiquitous everyday technology. In Germany, gas war was described as an unavoidable risk 'of daily life,' as everyday 'as electric-light switches and gas stoves' and something people just would have to learn how to live with, like 'the other technical things of modern life.' A contemporary commentator admonished every German to embrace the reality of the new fear and of the new commodity: 'Just as a child learns to clothe itself or the car owner learns to drive, every citizen should try on a gas mask in a gas shelter at least … once a year, in order to see how it works … to get rid of the unjustified aversion to this new piece of twentieth-century clothing.' In 1937 the 'affordable' People's Gas Mask (*Volksgasmaske*) became widely available in three sizes – for men, women and children – and every German was encouraged to buy one. The gas mask became 'a piece of daily life in the Third Reich' that helped to domesticate the threat of a future air war and served similar as a 'prophylactic' for fortifying civilians' 'weak nerves.'[44] It was, as
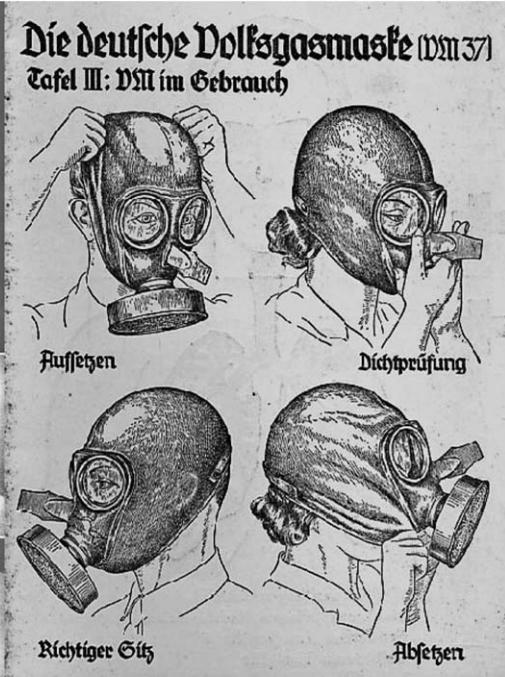
Figure 3

Figure 4

Figures 3–4. Coping mechanisms of German airmindedness. Reichsluftschutzbund's journal presents the new German gas mask with the comforting words '*Under the Volksgasmaske every German can feel secure!*' Instructions on the correct routines for its testing and use issued to civilians in the 1930s. Courtesy of Johannes Möller & Gasmaskmuseum www.gasmasklexikon.com.

summarized by Fritzsche, envisioned together with other terrorminded materialities to mold a new modern German citizen:

> Eventually the rhythms of daily life would adjust to the new and dangerous but not oppressive realities of the air age. Much as the modern house was constructed to keep out cold and rain and insects, the future house, built with fire-resistant materials and double doors and windows to prevent gas seepages, would withstand the additional rigors of gas war. If incendiary bombs were to fall on these rebuilt German homes, housewives would simply shovel them out of the door like embers which had fallen out of the stove. These same housewives would also cut their hair so that gas masks would fit more snugly; their husbands would no longer grow long beards for the same reason. Not only houses but also cities would be rebuilt, this time on a smaller, less concentrated scale to reduce their vulnerability to air attack. All in all, gas war was presented in a way that fitted it into domestic life rather seamlessly, Indeed, air readiness was moral uplift; 'people would once again hold their heads up higher, since they would have to keep an eye on the sky.'[45]

By 1939, thanks to such material and mental mechanisms, German civilians, compared with those of other nations, were, as Fritzsche puts it, 'better prepared for war and more resigned to its inevitability' (see Figures 3–4).[46]

Compared with Germany the British approach was more fearful of the death and destruction from air raids which created an 'air-raid phobia' among British politicians.[47] No government plans were drawn up on how to defend civilians against aerial gas

attacks and air-raid protection was ultimately seen as the responsibility of each individual citizen. This was reflected in the first official Air-Raid Precautions (ARP) circular in 1935 which contained information on antigas equipment and gas training meant 'to instill within the population the sense that they could protect themselves through self-help measures.' The majority of government funds went to gas preparedness which was believed to be cheaper and easier than building underground bomb shelters and fireproof buildings.[48] The result was a very different material politics than that articulated under German airmindedness.

However, in 1936 the government announced that 'a simple but effective form of respirator for use by the civil population' was in the works and would be given out for free if the need should arise. One year later, in April 1937, an Air Raid Wardens' Service was created, recruiting some 200,000 volunteers, to aid in the task.[49] The very same month also saw the first major European public outcry against terror bombings of civilians, this despite the fact that African, Asian, and Caribbean cities had been bombed – even with gas – since the 1920s. The difference in 1937 was that the civilians were Europeans, the Spanish inhabitants of Guernica, rather than the African inhabitants of Chechaouen or the Asians of Shanghai, and the pilots Germans instead of American or Japanese. A British observer in Spain described the 'supreme characteristic of mass terrorism from the air against the defenceless population of a great city' being that 'death and destruction arrive in an instant' and 'without warning.'[50]

The real breakthrough came in August 1938 with the Sudeten crisis between Germany and Czechoslovakia that led to the mobilization of Britain's ARP volunteers and placement of barrage balloons over London. Historian Tami Davis Biddle has given a vivid description of those preparations of airminded materialities and mentalities:

> In London, workmen toiled through the nights to dig sheltering trenches in the city's many parks, to distribute sandbags, and to dim the city's traffic lights. Air Raid Precaution (ARP) personnel tested sirens, distributed posters, made public announcements at sporting events, and prepared instructional films for the cinemas. Gas mask distribution centers stayed open twelve hours a day, and 'laggards' who had not yet picked up their masks were implored to do so via loudspeakers mounted on roving trucks. Airplanes circled overhead, trailing streamers asking volunteers to join the auxiliary fire service. Hospitals prepared to discharge stable patients to make room for emergency cases; their staffs inventoried equipment and stocked up on surgical supplies. The Church of St. Martin-in-the-Fields held day and night prayers for peace. Factories and shops made emergency accommodations for their employees and patrons: one shop 'readied brandy for the nervous, chocolate for the hungry, and games for the restless.'[51]

When the aviation celebrity Charles Lindbergh visited London a month later and contacted a store about gas masks he was told that they were sold out and could not be delivered 'for at least six weeks.'[52]

This issuing of gas masks was central in shaping airmindedness. A British woman, echoing Mumford, in 1939 credited the gas mask for creating a new sense of warmindedness among the British population: 'No one wants war, that's the point, though I think it took the gas mask to bring it home to people. It taught them a lesson. They, like myself for instance, are thinking more about things now.'[53] Airmindedness was however never a monolithic *mentalité*. The gas mask, despite authorities' pronouncements and planning, shaped a diversity of behaviors and attitudes and a multiplicity of contradictory emotional experiences of security and fear.[54] Testimony suggests that the new mundane materiality created new feelings of fear, like one woman's recollection of 1938 which even described gasmasks as inducing a visceral fear:

> As I looked through the lounge doors, I saw a sight which frightened me. The whole family
> and all the guests were standing in the lounge, on the table there were a lot of square boxes
> marked 'Small', 'Medium' and 'Large'. Each contained a gas mask. A man was fitting my
> mother, he asked her to breathe and he held a piece of paper against the end of the hidious
> contraption. Is it really as bad as all that? ... After I had my mask fitted I returned with you
> [her fiancee] to our sitting room. You kissed me but I felt too frightened to notice.[55]

However, people did not just experience fear but also comfort from the mundane reassurances of security and protection against the new threat that the new technologies provided. A woman volunteer issuing gas masks and gas mask cases in London recounts a telling episode:

> We were short of cases and an order came through forbidding us to issue any more except
> with masks. A very old woman came in and talked to Cap [her boss]. After a minute or two
> he beckoned to me. 'Here, deal with this will you,' and turned away to talk with a group of
> storekeepers. The old woman had come a long way. She and her husband wanted cases; they
> felt there was more protection with a case. Her rheumy eyes were anxious and tearful. 'But
> I can't come again tomorrow. It's the fares dearie. My old man 'e's that upset with it all and
> him not able to get about like ... . Besides they're better in a case, safer like ... .' Cap
> looked across as I handed her the precious cases, his left eyelid dropped imperceptibly as he
> turned his shoulder to this breach of official regulations.[56]

Not everybody was convinced about the masks effectiveness against gas although they believed them useful in managing fear, a view expressed by one woman who noted her husband 'thinks they will be entirely useless in a gas attack, and are just cheap substitutes for the genuine article which are issued to the public to keep them quiet by giving them a false sense of security.'[57]

Those experiences of fear and security varied and changed even after the urban terror bombings materialized and it became clear that their destructiveness had been overrated. Civilians' sense of their own fear and security, perhaps, too, was over-dramatized. According to Helen Jones, there were 'people eschewing protection, ignoring the siren and not taking cover' and that, 'gas masks were never used and often not even carried.'[58] These varying individual responses to and interpretations of the gas mask's functionality were not unique. It also applied to validated airminded materialities such as bomb shelters, as evidenced by a survey in 1940 that showed that despite the many killed by bombs, almost two thirds of Londoners did not rely on the protection of bomb shelters.[59]

The fear of gas attacks persisted among government officials and the public throughout the war, but the most horrifying urban death and destruction was caused by fire, a traditional urban menace. Aircraft-delivered incendiary and explosive bombs ignited conflagrations, first, during the German Blitz and later with horrific Allied attacks such as those at Hamburg, Dresden, and Tokyo. With the atomic bombings of Hiroshima and Nagasaki airmindedness instigated a higher form of terror during the Cold War, a new, more ominous and widespread fear of nuclear weapons, bearing the possibility of mutual destruction and doomsday for all of humanity.

Nuclearmindedness: domesticating the Bomb and the doomsday

The atomic bomb is said to have 'called' upon the world to make a 'huge psychological shift.' This together with emergent and reconfigured materialities is what I describe as nuclearmindedness, a new mode of terrormindedness, descendant of and similar to airmindedness as well as radically different. As Tom Vanderbilt has described the impact of

the first nuclear weapons: 'In one stroke, the concept of what it meant to live in a city, the parameters of security and the contours of daily life, had been fundamentally reordered. Over every city hovered the ghostly afterimage of Dead City.' Cities had now become prime targets of modern warfare, but some experts believed that city inhabitants could survive a nuclear attack, that doomsday and nuclear fears could be domesticated with urban materialities.[60] Not least, this threat, grounded in US–USSR Cold War conflict, extended to the North American continent, making American, not just European or Asian, cities into prime targets for destruction.

In the USA governmental nuclearmindedness can be said to have started in 1950 when the Civil Defense Office published *Survival under Atomic Attack* to educate and reassure Americans: 'You can survive. You can live through an atom bomb raid.'[61] Routines like 'duck-and-cover' drills, Conelrad tests and annual 'Operation Alert' exercises simulating nuclear attacks on US cities were akin to German airmindedness in creating a constant notion of a coming nuclear war. Andrea Tone has described this as 'readiness rituals' reflecting 'an equal measure of terror and faith. The apocalypse *could* be prepared for. And with the right tools and techniques, the nuclear devastation might be endured.'[62] Ordinary people took heed, even if they did not always take comfort. One New Yorker looking back on her childhood explained the fear making effect of these routines: 'To us, the Cold War was not an abstraction. It was the air-raid drills in school, the call for bomb shelters, and exposure to the deliberately unsettling horror of civil-defense films. … I could never figure out how my flimsy desk, with its worn inkwell and its years of name-scratching, could protect me from the atomic bomb.'[63] The flimsy desk was one US materiality that nuclearmindedness reshaped. Prominent examples of other nuclearminded materialities were school children dog tags, air raid sirens, the Emergency Broadcast Network, the National System of Interstate and Defense Highways, and the urban Nike-Hercules antibomber missile batteries which 'made the Cold War manifest in cities across the United States.'[64]

Of all these new materialities the one that, like the gas mask, stands out as the iconic nuclearminded technology is the *fallout shelter*. This technology drew on the prior development of bomb shelters, but its role in post-World War II life was more central and ominous compared to its predecessor. The shelter was supposed to protect against the effects of nuclear attacks and especially against radioactive fallout. The fallout shelter could be both comforting and frightening. Ruth Lassiter was one American whose basement fallout shelter of concrete blocks, iron rails and a door with a porthole made her 'feel safe,' while her fellow American Dorothy Day refused to enter the fallout shelter in City Hall Park during a mock hydrogen bomb attack of New York in 1955.[65] The American fallout shelter's public breakthrough came in 1961 with President Kennedy's appeal for a civil defense initiative that sought to 'identify and mark space in existing structures – public and private – that could be used for fall-out shelters.'[66] According to Kenneth Rose, this 'brought nuclear war into the homes of Americans,' and became 'an official enunciation' that the American home had been put on the front lines of the Cold War. Kennedy's proposal initiated a public shelter debate and a flurry of orders for private shelters. Then by the mid 1960s, the seeming urgency of civil defense waned, although the idea of the shelter stayed on in policy and in the public perception. Vanderbilt has described US civil defense as 'always something of a fiction, an act of collective hope that produced rituals of civic drama but never generated the government funding its proponents sought nor ever unleashed the presumed mania in fallout shelter building.'[67] Although an estimated 43% of Americans in 1963 had not made any plans to prepare their home for a nuclear attack millions of others did.[68]

The US history of the fallout shelter and nuclearmindedness is nevertheless just one very culturally specific case, and not even the typical one as it represents one key protagonist of the terror balance. There is a multiplicity of alternative national histories of the power of things to help cities and citizens to cope with nuclear terror during the age of 'atomic anxiety.' Among those only one example will be sketched here, that of Sweden. There the government was much more proactive than in the US and established 'some of the world's most elaborate shelter facilities.' A law was introduced in 1945 prescribing that every new apartment house had to include a protective shelter; by the 1990s more than 66,000 protective shelters had been built for more than 6.5 million of the nation's 8 million population. Policy specified that every Swede should not require more than four minutes to reach the nearest shelter. Each shelter should be made of at least 30 cm reinforced concrete with an airtight steel door to protect against biological and chemical weapons and able to withstand nuclear weapons 'at a distance.' Moreover, each shelter had to be furnished with compulsory survival equipment within 48 hours, which included, among other things, a 12-liter bucket and a 250 mm multigrip wrench of ISO-8676 standard.[69] In 1964 the *New York Times* reported that the Swedish, 'like 7.7 million moles in and out of uniform, have gone underground to create a viable second nation in the granite.'[70] Thousands of military and civil defense installations were built underground at a cost of $2 billion, among them the supposedly largest shelter in the world, which allegedly could be filled with 20,000 people within 5 minutes.[71] That this *mentalité* was long-lived is shown by the law's partial survival even into the twenty-first century. By that time the dominant man-made threat against cities had once again transformed into a new kind of terrormindedness which no longer came from above, from the air and from states, but from below, from the street and from individuals.

Terrorismmindedness: designing in and designing out terror from below

'*9/11 changed everything*,' has been a recurring remark since the terror attacks against Washington and New York in 2001. Even though this might, as has often been argued, represent a *new* form of terrorism, it does have a history, drawing on and modeled by pre-existing materialities and mentalities. Although the history of sub or non state urban terrorism, in the world as well as in the USA, goes back to the nineteenth century,[72] terrorismmindedness did not reach a widely global breakthrough until the 1990s when the terrorist threat 'grew rapidly' and several terrorist organizations 'realized that attacks on major economic centres not only cause severe damage directly to valuable building structures but also guarantee maximum exposure for the groups concerned in the media.' Spectacular terrorist attacks in big cities such as London, New York, Bombay, and Tokyo exemplified this turn. The new terrorism's foremost systembuilder was the Provisional Irish Republican Army (IRA), which, after several large bombings in Belfast in 1991–92, identified inflicting massive economic damages as a salient characteristic for reaching their political goals. Several car bomb attacks on London's financial centers, for example, resulted in damage estimated at $3 billion. To deter such attacks, in 1993 the government erected a 'ring of steel' to secure entrances to and regulate traffic within 'the City' – London's financial center – and introduced a network of cameras making it into one of the world's most surveilled space. In 2003 a 'ring of concrete' was added around the Houses of Parliament. Within a year both these 'rings of confidence' were seen as part of the city's 'daily life.'[73]

Despite London's prominence in the history of terrorism, the 'epicenter' of global terrorismmindedness is now Washington, DC. Its first major material adaptation to

terrorism came in 1983 with the installation of the first concrete Jersey barrier at the White House. This transformation of public space reached a dramatic point in 1995, indicative of the new emergent terrormindedness, when security officials closed of Pennsylvania Avenue in front of the White House. This action was criticized at the time as reflecting a 'bunker mentality.' The capital city has also become a center of a 'Homeland Security–Industrial Complex,' a reinvention of the nuclear era's Military–Industrial Complex as government agencies and private companies have adapted their skills to the new terror.[74] Shortly after 9/11 urbanist Mike Davis prophesised, reminiscent of an inter-war Mumford, that military and security companies of a new 'fear economy' would be 'rushing to exploit the nation's nervous breakdown,' as

> the new terror provides a powerful Keynesian multiplier. Thus the already million-strong army of low-wage security guards is expected to increase 50 per cent or more in the next decade; while video surveillance, finally beefed up to the British standard with face-recognition software, will strip the last privacy from daily routine. The security regime of airport departure lounges will likely provide a template for the regulation of crowds at malls, shopping concourses, sports events, and elsewhere. Americans will be expected to express gratitude as they are scanned, frisked, imaged, tapped and interrogated 'for their own protection'. Venture capital will flood into avant-garde sectors developing germ-warfare sensors and threat-profile software. As the evolution of home security already illustrates, the discrete technologies of surveillance, environmental monitoring and data-processing will grow into a single integrated system. 'Security', in other words, will become a full-fledged urban utility like water and power. ... Physical security retrofits – the reinforcement of building structures, vapour-and-trace detection systems, bollards and traffic barricades, bomb mitigation containers, smart doors, metal detectors, bomb-proof trash cans, biometric surveillance portals, reduced surface and underground parking, and so on – will impose huge and unavoidable expenses for cities trying to shore up their downtown economies.[75]

Several of the coping mechanisms concocted in Washington appear modeled on earlier terrormindedness such as the new 'duct and cover' advice to use plastic sheeting and duct tape to construct gas tight safe rooms, terrorist threat condition (Threatcon) levels, wmd-attack drills, and government distributed preparedness guides.

The mundane technology that is iconic of this era of urban terrorismmindedness is the *security barrier*, which, in the period after 1995, according to *The New York Times*, transformed from 'the newest accessory on this country's psychic frontier' into 'emblems of an unintended new mentality.'[76] In its various instantiations from Jersey barriers to heavy-duty flowerpots, the barrier provides protection against car bombs, the 'quotidian workhorses of urban terrorism ... producing the most significant mutations in city forms and urban lifestyle.' Of this type of barrier, the 'bollard,' the waist-high metal or concrete post, stands out. It is the ubiquitous expression of security, protecting civilian shopping centers, public and corporate buildings, as well as the device used to maintain the prescribed 'Inman standard' of 100 feet setback distance for US embassies. It represents the many material and institutional coping mechanisms connected with disciplining and controlling civilian and public spaces by aiming to 'design out terrorism' along three strategies: enhancing *fortification* through barriers; *managing access* in the cityscape using barriers, signs and curfews; and through increased *surveillance* (see Figures 5–6).[77]

The dilemma of terrorismmindedness, as of all previous terrormindedness, is that at the same time hope and fear are 'designed out' through technological and social mechanisms such as 'bollard intervals, hardened benches, strategic plinths, stand-off dimensions, community gates, CCTV cameras, rerouted traffic, private police forces, racial profiling, privacy policy, and prison,'[78] it also 'designs in' terror to our individual and

collective habitus through mundane mechanisms and materialities. The things that are meant to alleviate our anxiety also work to heighten it.

The barrier, like the gas mask, evoked diverse experiences of living with terror and security. One example is a public debate that followed the opening in Brooklyn in 2009 of a new rail terminal, entrance of which was ringed by 14 large granite and concrete bollards. Views varied widely on the security the bollards provided. One person was 'not sure exactly what they're for.' Among those that did, some saw a clear 'need' of bollards 'to protect' against terrorists. Other regarded them as serving 'no function as far as security goes' and doing 'nothing to protect against terrorism,' or that they at least did not 'protect me.'[79] Some even described them as going 'too far' in serving 'as a stark reminder of the threat of terrorism' and to 'exacerbate fears about our safety.'[80] A similar example of New Yorkers learning to live with the barricades comes from business tenants in the Wall Street district who in 2004 threatened to leave because of the constant reminder of the terrorist threat created by every day 'seeing a visually overwhelming security presence' in the form of barricades and blocked-off streets. This perspective was apparently shared by the City of New York which in 2006 ordered some 30 buildings to remove the security barricades that had been erected following 9/11, on the judgment they either were not necessary, 'obstructed pedestrian flow,' or that they might even 'do more harm than good.'[81]

There are also signs that the New York terrorismmindedness is being normalized and domesticated. In 2007 it was said that a 'craving for the solidity of walls' that had 'reasserted itself' after 9/11 had now begun to 'look like a permanent reality' expressed through a new 'mentality' and style of architecture dubbed '21st-century medievalism.' A warning was issued against this 'budding reality' and its accompanying 'notion that we can design our way out of" security problems, rather such a change 'should give us pause' as the new designs camouflaged 'a society ruled by fear.'[82] Inherent in all this is the notion that this urban materiality is part of propping up and reinforcing society's fearful mentality, that our terrors reside in our things.

| Figure 5 | Figure 6 |

Figures 5–6. Ubiquitous terrorismmindedness in use. Bollards introduced after 11 September 2001 to protect the streets of New York (left) and the doors to Department of Justice in Washington, DC. Courtesy of Claes-Fredrik Helgesson and the author.

Conclusion: no terrors but in things

This study of the material politics of technology has demonstrated how terror and security like other political and emotional entities reside not just in minds but also in things, in buckets, bombs, and bollards. Path-breaking works on the politics of technology such as those by Cowan and Hughes addressed the politics of work and of networks of technologies and through this research showed that there is not one right way, but many rewarding avenues for developing the political history of technology. Which one we choose matters, and the matters we choose make a difference. The subject history chosen here has been a history of technology of terror. It is a history from below, focusing more on experience than on innovation. In this perspective, it aligns with emerging trends in history of technology emphasizing technology in use,[83] and on the power of everyday technologies in the private and personal sphere. The subject matter chosen, ubiquitous technologies such as buckets and bollards, might be mundane but it would be a fallacy from that to conclude that they are also less important. Rather, to quote Siegfried Giedion: 'For the historian there are no banal things. ... He needs the unworn eyes of contemporaries, to whom they appeared marvelous or frightening.'[84] The power of things such as buckets, bollards, and bombs to marvel and to frighten should be central questions both to the historian of the political and to the historian of the technological.

For the student of politics the focus adopted here on technologies used in the everyday to cope with man-made terrors contributes to a novel kind of history of terrorism. The shifts in focus, away from the combatants of terrorism towards its targets and victims, and to its effects rather than its causes, provide new perspectives on what terrorism is and what its technologies do. We have to rethink our understanding of terrorism's use, impact and role to shape society in the past and in the present when we take into account that people have incorporated it into their daily lives regardless of whether the bombs exploded or not. This focus on the use and experience of technologies used in response to terror also has ramifications for the history of technology in that this history problematizes and challenges how use is conceptualized. This study could have been described as a history of technological *non-use* in that it primarily treats false starts and never realized dreams and nightmares; but this would be wrong. The fact that civilian gas masks and nuclear fallout shelters were never used in an attack is not the same as not having been used at all. As for terrorism, this study shows that a narrow view of what this phenomenon has embraced impoverishes the role and meaning of the uses and experiences of relevant technologies. Terrorism functions and does political work even if the bombs do not explode or other acts go unrealized. Gas masks and fallout shelters, as examples, still *have been used* and have done work through the comfort as well as the anxiety and fear they have provided their users. These uses existed and worked regardless of how correct past and present opinions are about whether these objects actually would have been able to protect their users if the gas would have been released or the Bomb exploded.

For scholars of technology studying material politics, the important lesson is that terrifying and comforting urban things have stories to tell not just about technological politics of the public sphere but also about the politics of technologies on private lives. This point becomes clear when this study is read as a history of the technology's use in *manipulations* of terror, of its fears and hopes, and how political collectives and individuals have been politically maneuvered through the power of technologies. Contemporary discussion on state terror and terrorism often uses the rubric of the 'politics of fear' to address a concern that politicians and authorities are trying to use fears of terrorisms to manipulate national and international constituencies.[85] This is a credible concern;

technologies such as gas masks and fallout shelters have been used by governments to try to shape citizens' sense of security and feelings of hope about surviving the effects of war as well as into participating in constructing new social orders, but even more important is that individuals, not just institutions, use technologies to manipulate. This history deals with the power of technologies to manipulate us, its users, and with our use of technology to willingly shape our affects as well as our attitudes (like the old British woman who got an enhanced experience of security from a cardboard gas mask case).

Finally, this focus on personal and emotional power of technologies is a beginning toward a more *material* history of technology, a history more intimate and embodied. Its concern is the private rather than the public experience of technology and of technology as being not just a system on a map, constructions in the mind's eye, or on a drawing board, but as a material 'thing' that you can hold, carry with you, wear, be inside and surrounded by, or use to create hope by putting it between yourself and your fears. The history of technology has developed important ways to think about the power of 'big' institutional and public technological systems such as power plants, nuclear missiles, assembly lines and gas warfare to affect nations, institutions and cultures, but has not come equally far in understanding the power of 'small' personal and private technical artifacts like light bulbs, handguns, brassieres, and gas masks to affect the politics and experience of their users, to empower, diminish, or alter their sense of self. This history is as much of people's hopes as it is about their fears and it still largely remains unexplored. A critical task for the political history of technology is to widen the focus from histories of the institutional shaping and the public power of technological systems to experiences of individual self-fashioning and the personal politics of technical artifacts. The history of technology has yet to tell compelling stories of how our dire fears as well as our great hopes have been enabled and constrained through the power of our mundane technical things.

Acknowledgements

Notes

1. Henningsen, 'Ekspeditionen til København,' 10. All translations from the Danish by the author.
2. Dictionary.com, 'Terror'; Harrison and Austin, *Some Tuscan Cities*, 116; Yardley, *Backing into the Limelight*, 156.
3. Henningsen, 'Ekspeditionen til København,' 325.
4. Seerup, 'Napoleonskrigenes største amfibiske operation,' 118; Henningsen, *København 1807*, 10; Rasmussen, 'Epilog,' 258–61; Krogaard, 'Bomberegnens følger,' 209, 232; Seerup, 'Æreløst som togtet til København,' 67.
5. Seerup, 'Æreløst som togtet,' 67.
6. Hoffman, *Inside Terrorism*, 133–4.
7. An interesting discussion of the Japanese kamikaze heritage of the 'human cruise missiles' used on 11 September 2001 is Croitoru, *Der Märtyrer als Waffe*.
8. Narasimha, *Rockets in Mysore and Britain*, 2. Before Copenhagen the new rocket had been deployed in a battle at Boulogne, but Copenhagen was its first use against civilians. The line

in the US national anthem was 'And the rockets' red glare, the bombs bursting in air.' It is not known to this author of the effects of the rockets on the civilian population of Washington.

9. Although not singularly embracing it, this study is aware of Joan Scott's imperative of historizing 'experience' and to which it contributes through providing evidence of subjects' experiential expressions of subject-positions regarding fearfullness, fearlessness, and doubt when facing man-made threats as well as those not seeing any threats to fear, see Scott, 'The Evidence of Experience.' For a pertinent critique of Scott's view of experience, see Pickering, *History, Experience and Cultural Studies*.

10. Thirteen firemen died in the bombardment, see Hassø, *Københavns Brandvæsens historie*, 253.

11. Wiene, 'Et ædelt og tappert folk,' 238, 247.

12. Quote from the newspaper *Adresseavisen*, in Hassø, *Københavns Brandvæsens historie*, 248; cf. Wiene, 'Et ædelt og tappert folk,' 242.

13. Wiene, 'Et ædelt og tappert folk,' 243.

14. Ibid., 242.

15. Ibid., 243.

16. I read the seminal articles by Langdon Winner on the politics of artifacts and Bryan Pfaffenberger on technological dramas as examples of system politics and community politics respectively, see Winner, 'Do Artifacts Have Politics?'; Pfaffenberger, 'Technological Dramas.' For an example of a recent article by Winner on the system politics of terrorism, see Winner, 'Trust and Terror.'

17. Pinch and Bijker, 'The Social Construction'; Cowan, 'The Consumption Junction.'

18. Domanska, 'The Material Presence of the Past.' Within STS this is primarily represented through work on material agency within actor network theory (ANT), for a prominent example see Latour, *Pandora's Hope*. For the influence of ANT's discussion of material agency within these new materiality studies see, for example, Bill Brown, *Things*; Dant, *Materiality and Society*; Miller, *Materiality*; Knappett and Malafouris, *Material Agency*.

19. For a critique of the prevalent emphasis on linguistic discourse within materiality studies, see Barad, 'Posthumanist Performativity.'

20. This could probably be read as another example of the dichotomy between agency-filled micro-histories vs. deterministic macro-stories discussed in Misa, 'Retrieving Sociotechnical Change.'

21. Schivelbusch, *The Railway Journey*; Schivelbusch, 'Railroad Space and Railroad Time.' This interpretation of Schivelbusch's work follows Alan Trachtenberg who in his foreword to the English translation of Schivelbusch's *Geschichte der Eisenbahnreise* (1977) describes him as 'wishing to recover the subjective experience' that the railway made possible and showing the construction of 'the industrial *subject*,' see Trachtenberg, 'Foreword,' xiv–xv.

22. Foucault, *Discipline and Punish*; Michel Foucault, *Security, Territory, Population*; Foucault, 'Technologies of the Self.' Technologies of power are also called 'technologies of domination' and Foucault describes governmentality as the 'contact between the technologies of domination of others and those of the self,' see Foucault, 'Technologies of the Self,' 19. For a review of Foucault and technological artifacts and in particular his influence on studies of ICTs and surveillance technology, see Willcocks, 'Michel Foucault in the Social Study.'

23. Some notable work inspired by Schivelbusch and Foucault are Crary, *Techniques of the Observer*; Crary, *Suspensions of Perception*; Seiler, 'Statist Means to Individualist Ends'; Seiler, *Republic of Drivers*; Otter, *The Victorian Eye*; Barak, 'Scraping the Surface'; Cohen, *Technology and the Early Modern Self*; Adey, *Aerial Life*.

24. For a benevolent critique of Otter's work as elitist cultural history, see Hård, 'The Victorian Eye and Its Blind Spot.'

25. Nye, *Electrifying America*; Garnert, *Anden i lampan*; Fischer, *America Calling*; Nye, *American Technological Sublime*; Herzig, 'Removing Roots'; Nye, *Technology Matters*.

26. See, for example, Gomart and Hennion, 'A Sociology of Attachment'; Thompson, *Making Parents*; Turkle, *The Second Self*; Edwards, *The Closed World*; Turkle, *Life on the Screen*. Also of relevance is some of Turkle's work outside ICT, see especially, Turkle, *The Inner History of Devices*.

27. Miller, 'Materiality: An Introduction,' 38.

28. Banerjee and Miller, *The Sari*, ii, 4. See also Miller, *The Comfort of Things*; Miller, *Stuff*.

29. The concept of 'terrormindedness' carries a lot of unintended affinities with Cindy Katz's 'banal terrorism' as the 'everyday, routinized, barely noticed reminders of terror or the threat of an always already presence of terrorism in our midst' and which 'is sutured to – and secured in – the performance of security in the everyday environment,' see Katz, 'Banal Terrorism,' 350–1. This use of habitus follows Bourdieu's formulation of the concept and the role the materialities of the Kabyle house played in aiding subject-making by inculcating dominant cultural norms and values, see Bourdieu, *Outline of a Theory of Practice*, 87–95; Bourdieu, *Logic of Practice*, 9–10, 271–83, 316–17. On the influence of Bourdieu on the new material culture studies as seen through Daniel Miller's work: Miller, *Material Culture*, 102–8; 147–57; Miller, 'Why Some Things Matter,' 3–5, 10; Miller, 'Materiality,' 6–8, 38.

30. For examples that to some degree engage with the role of technology and materiality in the history of urban terrorism, see Ashworth, *War and the City*; Coaffee, *Terrorism, Risk and the City*; Graham, *Cities, War, and Terrorism*; Davis, *Buda's Wagon*; Savitch, *Cities in a Time of Terror*; Coaffee, Wood, and Rogers, *Everyday Resilience of the City*; Coaffee, *Terrorism, Risk and the Global City*. David Nye has previously discussed the same examples of urban terror technologies against civilians in relation to security and protection but with different aims and conclusions, see Nye, *Technology Matters*, 161–84, 221.

31. Vanderbilt, *Survival City*, 54; Edmonds, 'How Australians,' 183–206. The uses and meanings of airmindedness have had positive as well as negative political and cultural resonances in Europe and America, see Edgerton, *England and the Aeroplane*; Fritzsche, *A Nation of Fliers*; Corn, *The Winged Gospel*; Wohl, *A Passion for Wings*. I am grateful to David Mindell who in the early 1990s pointed me to Fritzsche's continually inspiring and intriguing book.

32. Smith, *Urban Disorder*; Sherry, *The Rise of American Air Power*; MacKenzie, *Inventing Accuracy*.

33. As far as I can determine the two leading journals in the history of technology *Technology and Culture* (*T&C*) and *History and Technology* have only published two substantial empirical articles dealing with non-state terrorism: Walker, 'Regulating against Nuclear Terrorism'; Lavenir, 'Bombs, Printers, and Pistols.' For other articles in these journals tangentially dealing with the history of technology of terrorism, see the special post-9/11 issue on terrorism and technology of *History and Technology* 19 (2003), no. 1, as well as the following articles in *T&C*: Williams, 'Technological World We Can Live In'; Wosk, 'Photographing Desolation'; Mukerji, 'Intelligent Uses of Engineering.'

34. For two examples discussing such perspective, see Herman and O'Sullivan, *The 'Terrorism' Industry*; Jones and Smith, 'We're All Terrorists Now.'

35. Vanderbilt, *Survival City*, 54.

36. Diary entry by Virginia Woolf from 1 February 1915, quoted in Saint-Amour, 'Air War Prophecy,' 140.

37. Ibid., 132; Van Riper, *Imagining Flight*, 64.

38. Van Riper, *Imagining Flight*, 65; Saint-Amour, 'Air War Prophecy,' 132–3; Fritzsche, *A Nation of Fliers*, 206.

39. Mumford, *Technics and Civilization*, v, 272–3, 275.

40. Ibid., 275.

41. Ibid., 275.

42. Paul Saint-Amour has described Mumford as seeing this as how a contemporary political crisis 'has become ritualized, quotidian, a general rather than an exceptional case' and how the 'real war and the rehearsal for war become psychologically indistinct,' see Saint-Amour, 'Air War Prophecy,' 130–1.

43. Fritzsche, 'Machine Dreams,' 689, 694, 697, 699–703, 705, 709; Fritzsche, *A Nation of Fliers*, 209–11.

44. Fritzsche, 'Machine Dreams,' 697–8; Fritzsche, *A Nation of Fliers*, 195, 211, 214–15. The *Volksgasmaske* was a sibling of the Nazi's other community shaping consumer technologies like the *Volkswagen* car, *Volksempfänger* radio, *Volkskühlschrank* refrigerator and the contemplated but never realized *Volksflugzeug* airplane.

45. Fritzsche, *A Nation of Fliers*, 214. For similar thoughts along British interwar architects, see McGrath, *Twentieth Century Houses*, 211.

46. Fritzsche, 'Machine Dreams,' 705.

47. Meisel, 'Air Raid Shelter Policy,' 300; Lee, '"I See Dead People,"' 257.

48. Spiers, 'Gas Disarmament in the 1920s,' 297; Ewen, 'Preparing the British Fire Service,' 224, 213; Biddle, *Rhetoric and Reality in Air Warfare*, 12, 109; Werskey, *The Visible College*, 226.
49. O'Brien, *Civil Defence*, 70.
50. Lindqvist, *A History of Bombing*, 11, 50–2; Patterson, *Guernica and Total War*, 106–7; Jones, *British Civilians in the Front Line*, 57. Volunteer American airmen under French command bombed the city of Chechaouen in Spanish Morocco in 1925.
51. Biddle, *Rhetoric and Reality in Air Warfare*, 127.
52. Lee, '"I See Dead People,"' 264.
53. Woman quoted in Madge and Harrisson, *Britain by Mass-Observation*, 243.
54. For examples of how children appropriated gas-masks in un-anticipated ways, see Moshenska, 'Gas Masks.'
55. Joan Hurford-Veazey, *Love and War: An Autobiographical study of the years 1939-1945: Covering the Second Great War*, 15 September 1938, PP/MCR/199, Imperial War Museum London Archive (IWMLA).
56. Vera W. Reid, *Cameos of 1939–40* Diary, p. 27, microfilm PP/MCR/88, IWMLA.
57. Mass observation diarist DR2450 in reply to question 4 in directives 'September 1940 – gas masks (1–221),' Mass Observation Archives, University of Sussex Library.
58. Jones, *British Civilians in the Front Line*, 9.
59. O'Brien, *Civil Defence*, 508.
60. Rose, *One Nation Underground*, 5; Vanderbilt, *Survival City*, 74.
61. Quoted in Rose, *One Nation Underground*, 23.
62. Tone, *Age of Anxiety*, 94.
63. Rose, *One Nation Underground*, 132. This skepticism could also be found among children on the other side of the iron curtain.
64. Vanderbilt, *Survival City*, 180.
65. Ziliak, 'Nuclear Reaction'; Butigan, *Pilgrimage through a Burning World*, 35–6.
66. Speech by John F. Kennedy, quoted in Rose, *One Nation Underground*, 2.
67. Ibid., 37, 4; Vanderbilt, *Survival City*, 141.
68. Rose, *One Nation Underground*, 191.
69. Ibid., 125; Bergqvist, 'En lägenhet med plats för 76 personer,' 7–8.
70. Quoted in Vanderbilt, *Survival City*, 130.
71. Ibid., 130; Rose, *One Nation Underground*, 125.
72. Terrorism as an modern political tactic is generally traced back to the state terror of the French Revolution's Reign of Terror while modern substate terrorism is considered to emerge in 1870s Russia. The definition of terrorism used here is the so called 'new consensus definition,' i.e. that terrorism is 'a politically motivated tactic involving the threat or use of force or violence in which the pursuit of publicity plays a significant role.' See Weinberg, Pedahzur, and Hirsch-Hoefler, 'The Challenges of Conceptualizing Terrorism.'
73. Coaffee, 'Fortification, Fragmentation,' 117; Coaffee, 'Rings of Steel.'
74. Vale, 'Securing Public Space,' 40; Hoffman and Chalk, *Security in the Nation's Capital*, 12, 27; Wekerle and Jackson, 'Urbanizing the Security Agenda,' 37; Davis, 'The Flames of New York,' 45; Vanderbilt, *Survival City*, 199. See also Winner, 'Trust and Terror.'
75. Davis, 'The Flames of New York,' 45.
76. Brown, 'Designs for a Land'; Ouroussoff, 'Medieval Modern.' Those advocating airport screening technology as the best candidate for the iconic materiality of terrorismmindedness neglects the facts that these things are mainly the concerns of the affluent minority of frequent fliers rather than the majority of ordinary citizens, as well as these technologies are so far primarily being confined to airports and not affecting the everyday terrorismmindedness of cities which is the focus of this study.
77. Davis, *Buda's Wagon*, 7; Coaffee, *Terrorism, Risk and the City*, 73; Ouroussoff, 'Medieval Modern'; Coaffee, 'Fortification, Fragmentation,' 115.
78. Vale, 'Securing Public Space,' 42.
79. Jay Rivera quoted in Barry Shifrin, 'Tomb raters! Commuters think those bollards are for the birds, too,' *The Brooklyn Paper*, 6 January 2010, http://www.brooklynpaper.com/stories/33/2/33_02_bs_lirr_vox_pop.html; Signature FSRG quoted at Gersh Kuntzman, 'New LIRR terminal is a monument to fear and paranoia,' *The Brooklyn Paper*, 6 January 2010, available at http://www.brooklynpaper.com/stories/33/2/33_02_gk_lirr_angle.html; rhywun quoted at Benjamin Kabak, 'When a security bollard goes too far,' *Second Ave. Sagas*, 21 January

2010, http://secondavenuesagas.com/2010/01/21/when-a-security-bollard-goes-too-far/; Signatures Michael and Jaimie quoted at Stephen Brown, 'Int'l terror expert speaks: LIRR bollards are "overkill" and "ugly,"' *The Brooklyn Paper*, 22 March 2010, http://www.brooklynpaper.com/stories/33/13/33_13_sb_bollards_expert_main.html.

80. Kabak, 'When a security bollard,' 21 January 2010 (see note 79).
81. Noah Pfefferblit, quoted in Manjoo, 'Cityscape of Fear'; Buckley and Baker, 'Security Barriers Born of 9/11.'
82. Ouroussoff, 'Medieval Modern.'
83. For a prominent advocate of such a perspective, see Edgerton, *The Shock of the Old*.
84. Giedion, *Mechanization Takes Command*, 3.
85. See for example, Furedi, *Politics of Fear*; Altheide, *Terrorism and the Politics of Fear*; Hughes, *War on Terror, Inc*.

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