The absence of television: broadcasting and war in Britain, 1939-45

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It is a well-known story that, without any public warning, the BBC stopped television broadcasting in Britain on 3 September 1939 in the middle of a Disney cartoon. This makes it sound as if the closure of the world's first high-definition television service was hasty and unplanned. In contrast, the BBC's wartime radio output is hailed as a successful means of national unification and exhortation to victory, with landmark programmes that justified the BBC's monopoly thereafter. This chapter asks what the response of the BBC to the beginning of the Second World War reveals about British broadcasting, regarded as what the media theorist Raymond Williams (1974) called a technology and a cultural form. It investigates how the reasons for stopping BBC television and reconfiguring radio were intertwined with ideas about the cultural role of broadcasting as a socially inclusive medium, the technological development of radio and television technologies for military uses, and the ways that Britain deployed broadcasting in ways both similar to and different from other nations.

Television has a special relationship with war because of the cultural role of the medium in Western societies. The medium has a heritage of being 'live' and is expected to relay events as a form of mediated participation in public life and international affairs, connecting people to what happens beyond their immediate experience (Scannell 1990). Television can make war feel present and accessible, but it also claims to tell an authoritative, documented truth about current concerns and to work on ways of understanding them (Ellis 1999). The medium also returns obsessively to the past through commemorations and anniversaries, repeats of past programmes and the use of archive footage. In Britain our sense of the national past is crucially oriented around the Second World War, and British television especially "takes part in the construction of a national culture of public memory" (Ebbrecht

2007: 37). This also happens elsewhere in Western Europe, enabled by the relatively similar national institutional structures, often publicly owned or regulated, that have shaped what television is like. But Britain's pioneering work on the technologies and structures of broadcasting gave the country a distinctive approach to thinking about its wartime role.

Both television and its predecessor radio had civic and nationalistic aspects, and both media were established in Britain in the period between the First and Second World Wars. The BBC became the world's first scheduled radio service in 1922 and the first television service in 1936. The First World War ended an initial explosion in early radio activity, but the commandeering of radio frequencies for military purposes demonstrated its military and political importance and instituted state control of radio frequencies. War contributed to the vision of what broadcasting should be. The concept was the result of "a concerted effort on the part of big business and government, feeding on the elite public's fear of the masses, to change that vision to the highly centralized, one-way, restricted-access system that is broadcasting" (Hilmes, 2003: 29). The roles of television and radio in the Second World War's European combatants were different and depended on the specifics of each national situation, but in each, television and radio used both the hegemonic and the democratic tendencies of broadcasting. These include its centralisation and state regulation, but also its universal accessibility. When radio, television or both continued during war, their function was to reproduce a sense of national identity, imagined in different ways depending on whether they were broadcast by an invading or an occupied nation. There was television in Germany and France but not in Britain, for example, and this chapter argues that the absence of television in Britain is a route into exploring British history more broadly in this crucial period.

Television in 1939: promise more than reality

Television is a combination of two technologies. The ability to register images as electronic signals of varying intensity had been discovered in the 19th century and was developed as a form of fax communication for sending important documents via telephone cables. Wireless transmission enabled signals to be carried on radio waves through the air and received at a distance. Television was a combination of these technologies, and its associations with live broadcasting to a widely dispersed group of viewers (rather than being a recording and storage technology, like cinema or the phonograph) derive from this history. There was military potential, since the prospect of using radio waves to see television images of enemy positions, unobstructed by weather and over long distances, seemed a useful improvement on the practice in the First World War of photographing enemy emplacements using cameras mounted on aircraft. In 1924, John Logie Baird (Baird 1924) had published an article that mentioned "radio vision" using reflected waves to register an object. This became a radar technique used by RAF bombers in the Second World War to image the terrain beneath them and thus recognise their targets (Baird, Brown & Waddell, 2005). Radio, television and radar were variations on the same principles and each reached maturity in the late 1930s, going on to serve different purposes in civilian and military contexts.

Peacetime uses of television were an extension of national radio broadcasting and served national economic and political interests (Hickethier, 2008: 62-64). The airwaves were the property of national states and were regulated by international agreements signed by governments. Nations thus both competed and collaborated; in the USA, Vladimir Zworykin worked at the Radio Corporation of America (RCA)'s laboratories in the early 1930s and developed an electronic television camera. In Germany, the Telefunken corporation worked on broadcasting technologies. In 1928, Baird demonstrated colour television in London and the International Radio Exhibition in Berlin showed off television receivers to the public. In Britain, Electric and Musical Industries Ltd. (EMI) was formed in 1931 and worked on

Baird's television inventions. In 1936, after years of test transmissions, the BBC began to broadcast a daily television service using Baird's devices and also a competing system developed by Marconi, another British company. Television was demonstrated in department stores, exhibitions and at the 1937 World's Fair in Paris. While hardly anyone owned a television, many hundreds of thousands had seen one at a public event and there was a widespread expectation in developed industrial nations that the medium would emerge as politically and culturally important.

In the five years or so before the outbreak of the Second World War, the leading European nations raced to establish the first regular television service with satisfactory picture quality, known as High Definition television (Hickethier, 2008: 68-74). Pictures were created by horizontal lines of light and dark, and the BBC's pioneering service operated with the competing 30-line pictures produced by Baird Television and the 180-line EMI system, which could each be received on the same domestic sets equipped with small cathode ray tube screens. But High Definition was understood to mean pictures comprising at least 240 lines and EMI-Marconi's pictures were improved by 1935 to offer a picture of 405 lines. The company's standard for electronic camera and receiver technology won out and became BBC's standard for its television service. The German Reichspost (post office) in Berlin began broadcasting for a few months in 1935 but was stopped by a fire at the transmitter station until 1936. In France, the ministry of posts, telegraph and telephones had begun an experimental service with 60-line pictures in 1935, and in the USA, an experimental television station was operating by 1939 in the area around New York. The was a race to develop the technology of television production and reception, to gain national prestige.

The early television receivers available in Britain in 1936 cost about £85, affordable only by the wealthy, so although prices for the cheapest sets had fallen to about £30 by 1939 this was still six weeks' salary for the average worker and there were only about 20,000 sets

in use (Emmerson, 2009: 10). In contrast, there were 9 million licences for radio sets in Britain, giving about 90% of the population access to radio broadcasts (Brown 2011: 43). Moreover, technological and commercial restrictions limited the scope of television programming. The BBC had yet to fix difficult relationships with the industries controlling film newsreel, newspapers, cinema and live performance, each of which was threatened by television and competed with it for content and personnel. Although it made its own live broadcast programmes, the BBC had only been able to negotiate rights to show a very limited range of externally produced material, including Disney cartoons, two newsreel films per day, and short documentary features that had no box-office value to the commercial cinema operators (Gorham, 1952: 156). BBC television was a visual extension of BBC radio and regarded as such. As Rick Altman (2004: 16) notes, "the object that we know as a 'television' could have been called an 'enhanced radio' or an 'image radio' or a 'screen radio' or even simply a 'radio'", and in fact it was described thus during its formative period.

Watching television during wartime could have seemed like an ideal way to spend long evenings isolated in dark, blacked-out rooms, with better visibility of the relatively weak pictures on the small early television sets (Gorham, 1952: 161). A relatively inexpensive HMV combined radio and television set (costing £30) comprised a polished wood cabinet somewhat larger than a modern microwave cooker, suitable for standing on a table or sideboard (Emmerson, 2009: 11). Its front face held the tuning and volume knobs required for controlling sound and image, a tuning dial displaying signal frequency bands and a loudspeaker and television screen. The five-inch diameter screen, set in the upper right-hand corner of the device, was smaller than either the loudspeaker grille or the tuning display, so viewers needed to sit relatively close to the cabinet and view in low lighting. But it is unlikely that anyone would have bought a new television set once war had broken out, because a Sales Tax of 100% was introduced on luxury goods (Brown, 2011: 43). There was

concern that television signals might be used for enemy bombers' navigation, because the sole transmitter aerial was located on the top of a hill (to maximise the range of its very high frequency signals) at Alexandra Park in inner London and was thus a potential homing beacon (Gorham, 1952: 160-161). Moreover, television pictures of bomb damage might provide useful feedback for the enemy on the success or failure of German air raids.

The BBC television service was urban, London-centric, and staffed by and projected to a relatively small middle-class audience. The BBC was the national broadcaster but its television service was, in effect, regional rather than national. It was clear before the war, however, that broadcasting would be crucial for disseminating news and emergency instructions, and for maintaining morale, and these were the roles that radio played instead. The BBC had central offices and a huge network of regional and international correspondents feeding information to London. Broadcasting was an organism in which material was identified, gathered, transformed, and distributed (Bignell, 2019), and radio could perform this function nationally and also internationally, because its signals were very long range. Britain could broadcast radio to its Empire as well as within its borders. Television could not help to construct the nation or Empire as an imagined community, "a deep, horizontal, comradeship" (Anderson, 1983: 16) because of its limited and unequal accessibility. Radio as well as television were close to quotidian reality because they were mainly live rather than recorded media. News, current affairs and documentary offered visions of the public sphere, while domestic, family interactions and character relationships were explored in drama and fantasy. For television, this immediacy meant it privileged live high-profile "specials" such as outside broadcasts of ceremonies commemorating the end of the First World War, or the arrival of Prime Minister Neville Chamberlain at London airport after his 1938 attempt to negotiate with Adolf Hitler in Munich, for example, each of which were covered live by BBC

television cameras (Gorham, 1952: 153-156). But the tiny audiences for BBC television did not match ideas of national collective identity that were promoted during wartime.

The metropolitan, relatively elite form of 1930s British television was in tension with the discourses of national unity and inclusiveness that the outbreak of war validated, and which radio broadcasting successfully shaped. Programmes were created and transmitted from a metropolitan, English base at the heart of the British Empire, in close physical and ideological proximity to other national institutions such as government and the civil service, but the wartime BBC was not an extension of the state. By transmitting news about, and discussions of, war, broadcasting conveyed information with greater transparency and fairness than newspapers or newsreel cinema, because Britain had legislated for Public Service Broadcasting. The BBC was required by its 1926 Charter to be independent of state control, and to inform, educate and entertain its radio and television audiences. In war, this meant it should be neutral, acting in conformity with dominant normative values. Patriotism and considerations of national security were expected, but so too were accuracy and honesty.

Television defers to radio

Physical broadcasting infrastructure was just as important as the programmes that might be transmitted. A Broadcasting Committee was created by Government in 1935 to consider the actions required if war came and the deployment of BBC staff and technical resources was planned (Gorham, 1952: 142-144). BBC Research produced new oscillator drives, installed in 1938, that enabled synchronised radio transmission from each of the sixteen transmitters around Britain, making a single national radio channel possible. To prevent transmitters from being used as navigation beacons, groups of them shared the same wavelength. One group of four served England and Wales, and another group of four served Scotland and Northern Ireland. They all broadcast the same Home Service schedule, and when an enemy aircraft got

within 25 miles of a transmitter within a group, and thus might use its strong signal as a guide, RAF Fighter Command could instruct the BBC to shut the transmitter down temporarily (Gorham, 1952: 164-165). Local listeners could still receive signals from the other transmitters in the group. For greater resilience, the British government agreed with the neutral Irish Republic that its radio transmitters at Athlone, Dublin and Cork would synchronise with the England and Wales group. Subsequently, in 1940 the groups were rearranged and a new group added, used for the Forces Programme, with about sixty low-power back-up transmitters if bombing destroyed the high-power ones. The Alexandra Palace television transmission equipment was used to jam the German air navigation system, Y-Gerat, and BBC television technicians were deployed on new Very High Frequency (VHF) equipment in 1941 for the RAF's GEE navigational system. When US troops arrived in large numbers for the invasion of Europe, the BBC contributed technical facilities for the American Forces Network from 1943. All of this meant heavy workloads for BBC staff in creating and maintaining essential technical infrastructure, and there were insufficient resources for continuing with television.

On the day war broke out, Friday 1 September 1939, there should have been television programmes from 11.00 to 12.00, then 3.00 to 5.00 pm, and then in the evening from 8.00 pm until about 11.00 pm (Graham, 2005). The daytime schedule was a mix of items aimed at women and children, including Mantovani and his orchestra playing light music, Mickey Mouse cartoons and a live visit to Regent's Park Zoo. The evening was to include performances in *Variety*, a talk called *Practical Household Suggestions*, a film newsreel and a performance by the BBC Television Orchestra. But at 10.00 am Douglas Birkinshaw, the BBC's senior engineer at the Alexandra Palace studios, received a telephone call from Gerald Cock, Director of Television, telling him to close down at noon. Far from acting in panic, the staff transmitted the expected live coverage from the Olympia exhibition

hall, *Come and be Televised*, in which interviewer Elizabeth Cowell talked to people visiting the event. Cowell chatted to 13 members of the public about their interests and experiences. Two women discussed their love of outdoor swimming, Australian and West Indian visitors gave their impressions of Britain, and there were short performances by people who had brought along a ukulele and violin. The transmission ran late, and shortly after the intended closedown, the cartoon *Mickey's Gala Premiere* was broadcast until 12.15, followed by test transmissions for viewers to calibrate their receivers. Television came to stop calmly and would restart nearly seven years later with the BBC presenter, Jasmine Bligh, brightly saying "Good afternoon, everybody. How are you? Do you remember me?" (BBC, 1947: 77)

The BBC invested significantly in new radio channels, overseas broadcasting to the Empire, occupied countries and to Allied military personnel (BBC, 1955). These were national and international publics that television could not reach. Most programme production took place at Broadcasting House in London, and its Control Room received and then distributed programme feeds to the transmitters (Brown, 2011: 57). In case of bomb damage an emergency Control Room was established in the basement, put to use when bombs hit the building in 1940. For the same reasons an emergency control centre was set up at Wood Norton near Evesham in 1939, with six studios for Music, Schools programmes, Features and Drama production when these were transferred out of London (Gorham, 1952: 166-167). Regional centres were set up in Bristol, Bedford and Bangor to further disperse production, as well as about 150 small local studios nationwide. The BBC employed many women, who were not formally called up for war work until 1941, and BBC women gained important roles as technical assistants and equipment operators as their male colleagues were either conscripted into the services or deployed for war work.

BBC radio continued throughout the war with a modified schedule, based at first on news and recorded music (Crissell, 1997: 53-62). The radio schedule at the start of the war

comprised hourly news bulletins, with government information and instrumental music (often theatre organ solos) in the intervals between news programmes. The first weeks of war were relatively uneventful and British radio listeners quickly complained about the dullness of the emergency schedule. The BBC began to introduce entertainment programmes featuring established comedy stars from music hall and cinema, and devised zany sketch show formats such as *It's That Man Again* (*ITMA*, referring to Adolf Hitler). Musical variety programmes included *Hi Gang* and *Hippodrome* (broadcast from the eponymous London venue), and there were also speech programmes aimed at specific audiences like *Children's Hour*, *In Your Garden* to help people grow vegetables for the table or to cook more effectively with rationed food. The tradition of an annual address by the head of state began with King George VI's Christmas Speech of 1939. The BBC maintained a stance of reporting both bad and good news and took greater account of its wartime audience's desires for entertainment than it had done in the 1930s. The scarcity of competition from live cultural events, overseas commercial radio or newspapers (whose supplies of paper were rationed) meant that its radio broadcasting became a shared public space that helped to promote dialogue across social classes, geographical regions and between the sexes. The inherent democracy in broadcasting assisted radio in a way that was not then possible for television.

The conversion to wartime schedules reflected the massive reorganisation of the British population into the armed services and centrally organised farming and factory production (Brown, 2011: 13). In mid-1939 the British Army comprised 224,000 personnel plus 320,000 Territorials (local part-time reserves). By the outbreak of war in September 1939 the Army had risen to 865,000. Until their deployment overseas, these military forces comprised a huge new audience for broadcasting, and in January 1940 the BBC introduced a Forces Programme based around light dance music (initially as a response to its commercial rivals), aimed at troops but quickly becoming a popular entertainment channel (Street, 2002:

73). In December 1941 it became necessary to conscript women as well as men, directing them mainly into factory work (Brown 2011: 16). There were now 3.25 million people serving in the British armed forces, including over 200,000 women, rising to 4.5 million combatants by 1944 including 350,000 women (Brown, 2011: 30). There were another 3.25 million people working in the war industries, such as munitions and shipbuilding, and 350,000 people engaged in full-time civil defence occupations. In these circumstances, collective listening to radio was important for morale and for maintaining concentration during long periods of shift working. The BBC introduced *Music While You Work* in June 1940, with jaunty popular music intended to accompany repetitive labour, and *Workers' Playtime* in June 1941, in which programmes were broadcast from factory cafeterias with large live audiences of mainly female workers (Street, 2002: 73-74). National radio was much more suitable for this collective listening than the private domestic viewing situation that had characterised British television.

In wartime the Empire and enemy nations were of increased importance as audiences for BBC overseas broadcasts. New studios, control rooms and transmitters were used, transmitting at greater power and on a larger number of wavelengths to combat signal jamming. There had been a single high-power long wave transmitter, at Droitwich, which was shut down so that it could not be used for enemy air navigation, and instead it was switched over to medium wave for European broadcasts. BBC's original eight short wave transmitters at Daventry were increased to 43 by 1943, broadcasting BBC programmes and also relaying America Calling Europe from New York (Street, 2002: 77). Later, after the Allied invasion of Europe in 1944, mobile transmitters were used by the BBC War Reporting Unit to beam breaking news back to the UK. Broadcasting by other nations, especially Axis powers, required an expanded Monitoring Service, based from 1943 at Caversham Park near Reading. Further BBC technical effort was required for identifying enemy jamming stations.

External Services broadcast to different time zones, and therefore by 1945 BBC had set up nearly forty recording channels to enable time-shifting of programmes. BBC Research also invented the Midget Disc Recorder in 1943, which was used to record live sound from the D-Day landings, for example (Street, 2002: 80). Radio was the dominant medium because sound could convey immediacy and was also easy to access within the daily routines of its listeners.

Public desires for visual pleasure and for visual experiences of news and current affairs were satisfied not by television but by print media in magazines such as *Picture Post*, and in cinema. The documentary films made during the Second World War contrast with the live television of the 1930s', which was based on witnessing events as they occurred, usually with spoken commentary but no editing or music to shape an emotional tone. Cinema documentary and newsreel did not represent an authentic reality in any simple way and were more subject to creative and interpretive intervention than live radio or Outside Broadcast television. Wartime factual cinema emerged from the British Documentary Cinema movement of the 1930s and included *Fires Were Started* (1943), for example, about the heroic London Fire Service responding to the incendiary bombing of the city. Despite using footage of real firemen in action, the film's narrative construction through editing, music and camera techniques was shaped to emphasise patriotic values of resilience, physical courage and teamwork.

Cinemas were briefly closed at the beginning of the war, because the large numbers of people gathered in one building presented a risk during air raids. But because air raids did not immediately occur, cinemas outside London were allowed to reopen within a fortnight, and by the end of 1939 filmgoing was again possible everywhere. The conscription of young men affected cinemas by depriving them of staff, since only the projectionist's job was regarded as essential. But a large workforce of women was recruited to staff cinemas, and the supply

of films was maintained because Hollywood product (comprising the majority of films screened before and after the war) continued to be available throughout. War stimulated British filmmaking, placing the industry at the service of national morale building. Celluloid film was regarded as an essential material and rationed under the control of the Ministry of Information, which vetted the scripts for films and financially supported some feature film production (Aldgate and Richards, 2007). Patriotic British films included military subjects such as the RAF in *The Lion has Wings* (1939) or the navy in *In Which We Serve* (1942), Laurence Olivier's rousing adaptation of Shakespeare's *Henry V* (1944) and the comedy *Let George Do It* (1940). By 1945, the habit of regular cinemagoing was fully entrenched in Britain, and about one-third of adults went to the cinema at least once per week.

The electronics companies that made the expensive television receivers of 1939 transferred to war production, making military radios and radar screens. It could be said that British television did continue during the Second World War, but in form of radio location and radar imaging, rather than in broadcast programmes. Baird Television Ltd., a major manufacturer of cathode ray tubes for television, converted to making the tubes into the screens used in the various radar technologies used on land, sea and air, amounting to 110,000 sets by the end of the war (Hills, undated). They worked at full capacity and stopping television broadcasting was partly a result of decisions about the relative importance of different kinds of production. Simple civilian radio receivers were made in huge quantities, but no new television receivers because radio could fulfil national news and entertainment functions that television could not.

Television becomes radar

The greatest fear among the British public in the years prior to 1939 was of aerial bombing (Brown, 2011: 8). Images of the damage done by bombers in the Spanish Civil War, and in

the conflicts in China and Abyssinia in the 1930s had been commonplace in newsreel and newspapers, and British people also remembered air raids and poison gas in the First World War. Defences against mass bombing raids, such as biplane fighter aircraft or static balloons over cities, were poor. Developments in aircraft design enabled some bombers to fly at over 300 miles per hour, faster than the fighters supposed to stop them, but a key problem was the difficulty of detecting bomber raids in the first place. Britain relied on the Royal Observer Corps (formed in 1928) which was equipped with optical, infrared and acoustic detectors. Each of these technologies was ineffective, short range and affected by weather conditions. The best device was the Sound Mirror, a huge curved concrete wall with microphones placed at the curve's focal point. Nevertheless, when it picked up aircraft engine sounds at the coast it could only give about four minutes' warning. In 1934, an RAF exercise to test Britain's readiness modelled a bombing attack on London, and the Observer Corps missed about half the attacking aircraft, with all targets predicted to be destroyed. As a result, a Committee for the Scientific Survey of Air Defence investigated new aircraft detection and defence technologies (Baird, Brown & Waddell, 2005). At the time, rumours circulated that Germany was developing an invisible Death Ray that could destroy aircraft using radio waves, and the Committee asked Robert Watson-Watt, head of the Radio Research Laboratory, whether this was possible. Calculations showed that the amount of power required made the Death Ray impractical, but that radio waves might be reflected from and thus identify attacking aircraft, leading to the development of radar.

Watson-Watt had been an advisor to Baird Television Ltd., because of his expertise in cathode ray tube screens (Baird, Brown & Waddell, 2005), and he demonstrated radar in February 1935. Using television signals broadcast from the BBC's Daventry short wave transmitter, he showed that they were reflected from an RAF Heyford bomber, making a visible trace on a cathode ray screen even when the aircraft was several miles distant.

Watson-Watt's team began a top secret project using modified Marconi television sets, at Orfordness on the remote Suffolk coast, and achieved detection of aircraft at 60 miles distance. Government finance was given for the building of Chain Home, a network of radar stations on the east coast, using pulses of radio waves that measured the distance to an aircraft and its height, with a range of 200 miles (Anon., 1938). The transmitter stations were based on television aerial designs by Baird Television (Emmerson, 2009: 10) and comprised three or four tall towers with arrays of metal aerials, made by the Marconi company, slung between them. A concrete bunker housed the transmitter equipment, which could quickly change frequency in the event of jamming. Nearby were the wooden, non-conducting receiver towers and a bunker in which an early form of computer compared the reflected signals against known flightpaths and thus located where the enemy aircraft were. The stations were completed by 1937, and testing (the Biggin Hill Experiment) demonstrated the need for a command and control system. Signals were tracked on a huge map, with bombers' movements plotted by staff from the Woman's Auxiliary Air Force. Fighter aircraft were controlled from the ground using this network of communications between Chain Home detectors, control stations and fighter aircraft, becoming especially important in the Blitz attacks on English cities in 1940 (Gardiner, 2004: 313-316). The system went into continuous operation in April 1939 but remained secret until 1942. After the war the Chain Home towers were almost all demolished, though their relationship with television was perpetuated when the Great Baddow tower was used for BBC test transmissions in 1964 before the launch of colour television.

The RAF used Airborne Interception (AI) radar to identify enemy aircraft, but the sinking of cargo ships that brought food and raw materials to Britain gave urgency to the development of Air to Surface Vessel (ASV) radar to detect U-boats (Bowman 2014: 59-60). The first such Coastal Command aircraft were working by the end of 1940 but early systems

required submarines to be fully surfaced and no more than three miles distant. ASV became increasingly effective as improvements were made (Winston, 1998: 210) and by May 1941, German submarines could only operate safely off the coast of West Africa or in the central Atlantic because these were beyond the range of radar aircraft. By the summer of 1942, the German Navy introduced a receiver that could detect the radar scans, but these countermeasures had limited range. There was an arms race between Britain and Germany in air-to-air radar, with German night fighters equipped with on-board radar transmitter aerials and cathode ray screens to intercept British bombers. Some British bombers had signal jammers to overwhelm German fighters' radar, they dropped aluminium foil ('Window') to confuse radar images and British Mosquito night fighters used detectors that could hunt German opponents by tracking their radar transmissions. The wartime seas and skies were busy with variations of offensive and defensive transmission systems and screens deriving from television technology, used to visually identify combatants' forces.

Nazi television

Wartime television and radio developed differently in Germany. The Nazi party claimed that television was invented in Germany because Paul Nipkow, who had studied signalling technology in Berlin in the 1880s, had worked out that images could be dissected into spots of light, and that these flashes could be transformed into electrical impulses and reassembled by a receiver (Hickethier, 2008: 61). The National Socialist government gained power in 1933 and German national radio broadcasting was placed under the authority of the Propaganda Ministry. In accordance with Nazi racial policy, Jewish employees were expelled from the institution along with political opponents. Programme production for an experimental television channel was placed under the control of the *Reichsfunkgesellschaft* (the Reich radio society) and its transmission apparatus under the Ministry of Aviation

because of its relationship with military communications. The first director of the renamed "Paul Nipkow" television service was Carl Boese, the Nazi official responsible for mass public events. Unlike the domestic distribution to home receivers that characterised early British television, the German audience was addressed through *Fernsehstuben* (television rooms) holding 20 to 30 people, mainly within the premises of local post offices. At first there was a one-hour programme for the few months in 1935 preceding the station's destruction in a fire, and when television resumed in 1936 there were short films, live vaudeville performances from the Berlin studio and filmed sporting events. Sequences at exterior locations were shot on film that was very rapidly developed in an automated process, before being transmitted wirelessly. For the Berlin Olympics of 1936, about 150,000 viewers are thought to have seen some of the eight hours of live broadcasts per day in the television viewing rooms in Berlin and Hamburg (Uricchio, 1989). Nazi television emphasised entertainment and national prestige and was watched collectively rather than by individuals or family audiences.

Despite the potential propaganda value of television broadcasts of live events, Nazi television was of limited significance (Hickethier, 2008: 70-2). Television coverage of the Nuremberg Rallies, using cables to transmit signals from Nuremberg to Berlin for transmission, was abandoned after unsuccessful attempts in 1936 and 1937. The cinema coverage of the Rallies and the Olympics in Leni Riefenstahl's epic films were perceived as more effective. Television in Germany reverted to adapting existing radio programme formats, especially orchestral music and singers broadcast from television studios, alongside information and public service presentations. By the beginning of the Second World War, there were still less than 30 television rooms, all located in Berlin or Hamburg, but the Nazi government was preparing to introduce a low-cost, domestic television set, the *Einheitsempfänger* (standardized receiver) for home use. Hardly any were made because

German factories were converted to war production, but television programmes continued to be transmitted during the war. Television entertained wounded or recuperating soldiers, with the highlight on Saturday evenings being *Wir senden Frohsinn, wir spenden Freude* ('We send joy, we spend pleasure'). This entertainment spectacular featuring stars of radio and vaudeville was broadcast live from the *Reichssportgelände* (Reich sports arena) to the television rooms and also to military hospitals. The service stopped after the Allied invasion of June 1944 but was restarted in the West of the country, the Federal Republic, once Germany had been partitioned in 1948.

The German troops occupying Paris from June 1940 initially targeted the Eiffel Tower aerial of the French experimental television service for disassembly and recycling into war manufactures, but Telefunken restored the damaged equipment and converted it to the German 441-line transmission standard (Truckendanner, 2014). This enabled programmes to be made for German occupiers, propaganda to be disseminated to the 1,200 households in Paris with television sets, and a market to be established for German Telefunken receivers. The *Fernsehsender Paris* (Television Station Paris) operated between May 1943 and August 1944, under the control of the former head of the "Paul Nipkow" Berlin station, Kurt Hinzmann. Studios were established at the former "Magic City" dance theatre in rue de l'Université, and about four hours of programming daily included music and performance, documentaries about German history, places and customs, and news broadcasts. The transmissions reached across the English Channel, and a British monitoring post on the cliffs at Beachy Head gained valuable visual evidence of RAF bombing accuracy and levels of damage in French cities (Gorham, 1952: 235). Again, television led both in the direction of morale boosting and live participation, but also towards the use of broadcast transmission as a technology for surveillance and control.

Television in the aftermath of war

The eventual success of its radio broadcasting, despite an unpromising start, positioned the BBC as a much-valued national institution in the post-war period as its own assessments of its work repeatedly stated (BBC, 1945), but the association of the BBC with dry, official and governmental broadcasting required consideration of its future before the war was over. Early in 1944 a Cabinet Committee on broadcasting was set up, chaired by the Minister for Reconstruction, the Earl of Woolton, a Conservative politician influenced by lobbying from advertising interests who later promoted the establishment in 1955 of the Independent Television (ITV) commercial channel. The Committee discussed the problems of the future organization of broadcasting in Britain, such as how to prevent overseas commercial stations like Radio Luxemburg (set up by a consortium of British commercial interests) competing with the BBC, and how to fund the post-war propagation of the British world-view to foreign audiences carried by the BBC's massively expanded Overseas Services. Each would require significant continued investment by the British state. For example, Radio Luxemburg, which had closed down during the war, was initially reopened and controlled by SHAEF (Supreme Headquarters Allied Expeditionary Force), to broadcast popular music and propaganda to the nations of Central Europe formerly under Nazi rule, but the station was then returned to commercial independence and competed again with BBC radio. The BBC had entered the war with a staff of 4,233 people and 23 radio transmitters, which had grown by 1945 to a staff of 11,417 and 138 transmitters, broadcasting for 150 hours each day (Gorham, 1952: 213). The scale and significance of the wartime BBC raised the questions of whether it should be supported and what it should do in the post-war period.

The Hankey Committee, meeting in 1943, had recommended the continuation of television as part of the BBC's monopoly on broadcasting. Britain's television service resumed in the London area in June 1946, followed by transmissions to the Birmingham area

in December 1949. The main spur was the economic imperative to grow the economy by increasing enlarging the market for television sets, as consumer goods came back into production. However, there were shortages of glass for the cathode ray tubes, wood for the cabinets, and skilled engineers to assemble the electronic components (Gorham, 1952: 237). Thus, radio remained the dominant medium, with BBC investment in radio totalling £214,587 in 1945-6 while the budget for television was only £14,487 (Street, 2002: 87). In 1945, France re-started television broadcasting using the *Fernsehsender Paris* equipment left behind by German occupying forces. Italy launched its public service channel RAI in 1952, while Denmark and Belgium launched television in 1953. Other European countries followed in the second half of the decade, each of them public services, until commercial Independent Television (ITV) started in 1954 in Britain. The second half of the 20th century belonged to television.

Initially, post-war programmes in Britain were for limited hours and audiences were mainly middle-class. A public service ideology, featuring educational and cultural content, linked European approaches to television in contrast to its commercial form in the USA. Television grew dramatically in the USA, where in 1945 there were nine television stations (in New York, Los Angeles, Chicago, Schenectady and Philadelphia), and probably about 7,000 television sets in use (Abramson 1987). This rapidly rose to about 2.4 million sets by 1949. A very high marriage rate and thus birth rate after the war stimulated the creation of new households (Spigel 1992: 36-72) and television took off as a domestic American technology. In Europe, television production and programming grew much more slowly because post-war governments and taxpayers were burdened by the costs of the conflict. In the Cold War, television became both a tool of and a symbol for modernity and reconstruction via consumerism. Institutionally, the Cold War divided broadcasters into opposing blocs. The Organisation Internationale de Radiodiffusion (OIRT) was founded by

the Soviet Union in 1946. The European Broadcasting Union (EBU) was founded in 1950 by the BBC and centred on Western Europe but expanded to include broadcasters from the Mediterranean and Middle East (Bourdon 2007). In Western countries, television was associated with consumption, leisure and individualism, while in the East it was a medium for the implementation of state ideology. As a medium, television was associated with Americanisation, requiring adaptation to European values while retaining its associations with new, modern lifestyles.

After the discovery of the properties of electromagnetic waves and their implementation for radio and television at the end of the 19th century, the evolutionary paths of these technologies were by no means determined. That radio and television became separate domestic broadcast technologies was merely one line of development, as their roles in the Second World War show. Both civilian and military uses of radio thrived, while television was relatively marginal and mutated instead into its sister technology, radar. Competition between individual inventors, nations and corporations was harnessed to push technologies of transmission and reception very quickly, and the ideological character of the different warring powers produced radio and television cultures that were relatively distinct. The absence of television in Britain from 1939 to 1945 offers, paradoxically, an effective focus on the significance of broadcast media in the period.

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