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The Visual Representation of Germs – a typology of popular germ depictions.

Abstract

Germs have been represented visually in popular texts for well over a century, yet little is understood about the dominant practices/concepts resident in such images. This paper presents a new typology of popular germ representations from the UK consisting of three main categories: Scientific, Carrier and Analogous. The first category largely pertains to the realm of the scientist, the second to domestic space and social conventions, and the third, primarily, to the realm of the imagination. The study identifies thirteen sub-categories and discusses each in turn. We argue that a more varied range of germ images exist than the previous binary positioning of germ representations in the United States – harmful and beneficial – would suggest. We account for the continued adoption of an analogous approach in relation to four key cultural forces and problematize the use of monster-like imagery and its alignment of ugliness and obesity with disease.

Introduction

Microorganisms have been visually represented in the scientific community since Antonie van Leeuwenhoek drew the first image of 'animacules' from a microscope slide in 1676 (Smit & Heniger, 1975). During the early twentieth century, as the germ theory of disease became broadly accepted and understood by a wider public, illustrators and graphic designers were posed with a problem – how do you alert *a lay audience* to this 'invisible enemy'? This question remains vitally important today given the on-going promotion of commercial products that claim to destroy germs, cyclical public health campaigns, and crucially, rising fears about anti-microbial resistance worldwide and the spread of infections.

Worboys (2000) argues that germ practices, including the representation of germs, deserve as much attention as germ theories. However, this area of health communication has been neglected as a whole. Brown (1997), Tomes (1999) and King (2014) highlighted broad creative strategies taken by visual communicators with regards to germs and hygiene in the twentieth century. However, a systematic examination of the full variety of germ tropes evident in popular culture has not yet been undertaken. Our previous work (Stark & Stones, 2019) examined germ representations broadly in terms of the historical landscape of early to mid-twentieth century British popular culture. Moving beyond the methodology of case studies to a

visual typology, in the research presented here, allows us to effectively identify persistent design practices and to conduct nuanced analysis of the identified tropes.

The questions this paper addresses are: How are germs visually represented and how may they be categorised? How do cultural forces impact upon the development and perpetuation of particular types of germ representation?

Situating the Visual Representation of Germs

The visual representation of germs is significant given the potential impact images may have on the way audiences conceptualise or understand germs. Since they are essentially invisible agents, it is the designer, illustrator or micrographer who must give them form. Engel (1960) described how the germ theory of disease is easily distorted given the germ's invisible omnipresence. But how is distortion manifest in the way germs are presented and what are the implications of creative interpretation? In a number of studies, popular images of germs are credited with having significant influence on the understanding of germs. Jones and Rua (2006) demonstrated how popular media images influenced children's own germ drawings and led to incorrect or incomplete understandings. Germ representations on hospital posters have played a key role in informing nurses' understanding of the mobility of germs (Jenner et al, 2005) or perceptions of the origin of disease amongst wider audiences (Rubin et al, 2014). Given its role in the wider sphere of health communication, the germ representation carries meanings that may shape lay audiences' perceptions of the body and infection and inform naïve understandings of biology, with significant consequences for hygiene practices.

Audiences may also respond emotionally to germ visual representations. In 2005, for example, broadcasting restrictions were placed on a Domestos Television Advertisement by the UK Advertising Standards Agency (ASA) due to complaints regarding children's responses to its gratuitous germ imagery (Pearlman, 2005). There are also cases in which germ representations are perceived positively, to the detriment of the communication's essential purpose (King, 2014). Further, seeing visual representations of germs are, to the viewer at least, one accessible way of engaging with the subject of germs from a safe distance (Fokkinga & Desmet, 2012).

Though academically there is little written about the representation of germs in popular culture what is already acknowledged is the rhetoric present in the media's

presentation of a war against germs. As King (2014, p.101) eloquently positions it: “Bacteria appears as sinister anthropomorphic creatures: as killers, foreign invaders and phantoms”. King (2014) also points to the beauty frequently evident within visual germ representations and divides germ representations into two categories– ‘the dwarf narrative’ and the ‘outbreak narrative’. The former is described as having qualities such as humour, childishness, and cuteness. The outbreak narrative focuses on contagion and invasion and presents a more sinister side of germ representations. Reflecting this distinction, Tomes highlights that cartoons from the U.S. in the early twentieth century facilitated the representation of tuberculosis as either a ‘menacing or whimsical character’ (Tomes, 1998, p.120). Whilst both Tomes’ (1998) and King’s (2014) work are important, their seemingly binary distinctions of germ representations in the United States, with ‘species’ variously classified as either good or bad, do not recognize the inherent ambiguity in other germ imagery. We therefore sought to systematically identify and analyse representations with a view to constructing a more comprehensive and nuanced typology.

Methodology

Typologies describe and explain the way that a phenomenon can be characterized and differentiated (Ritchie et al, 2003). They have previously been applied in the field of health communication including the analysis of hygiene messaging (Taylor, 2015), organizational health promotion strategies (Johnson & Baum, 2001) and the unintended effects of health campaigns (Cho & Salmon, 2007). Typologies have also been used to study various visual forms of persuasive messaging including use of metaphor (Phillips and McQuarrie, 2004) and spokescharacters (Callcott & Lee, 1995). This study sought to produce a typology using an approach informed by the constant comparative technique characteristic of grounded theory (Strauss & Corbin, 1990). This involves using inductive analysis to classify material and formulate categories that enhance understanding by making inherent patterns explicit.

Sample Method

The typology presented here was derived from the identification of germ representations found in print and digital media, made and/or distributed in the UK from 1900 to today. The following archives were searched in-person: Wellcome Library, British Library, British Film Institute, National Archives, Unilever Archives and Boots Company Archive. Digital image databases consulted included VADS, Mary Evans Picture Library, John Johnson Collection, Advertising Archives and the History

of Advertising Trust. Newspaper/magazine archives including GALE British Library Newspapers, National Archives Newspaper Archive and *Punch* Archive were searched to locate print-based advertisements. Search dates for these archives were restricted to post-1900 dates, and based on keyword searches for 'Germs' and 'Bacteria'.

More recent images featured on English-speaking websites were also examined. These were identified through systematic use of Google Images to capture popular images currently in circulation, including from international sources. The top 50 images based on the following search terms were examined: 'Germs', 'Germ adverts', 'Hand sanitizer adverts', 'Wash your hands posters' and 'bleach adverts'. Both still and moving image, and interactive and game components were included for analysis. Purely text-based sources were also consulted to provide a context for analysis. Youtube was searched using the tailored terms 'germs' and 'bleach adverts' and various screenshots were included in the sample. Using this method of identification, 240 images were examined in detail. This, whilst not exhaustive, enabled sufficient breadth to the study covering a range of media and publication forms, and a broad time period.

Methods of Analysis

The act of designing a typology is not without philosophical difficulty. The very act of classification is in itself not reflective of a real or natural classification (Kress and Van Leeuwen, 1996). To aid in interpretation and classification, use of accompanying text and paratext within posters and advertisements was a vital tool to anchor the meaning of images where possible and to mitigate fanciful interpretations.

Haskell (1993) raises methodological complications surrounding the use of images by historians and these require noting. We do not claim to present 'the truth' about how audiences perceived germs at particular periods but instead draw on Gilman's (1995, p.16) third usage of image analysis by focusing on the 'internal iconographic tradition' or internal vocabulary of the work. Gilman (1995) uses this term to place emphasis on artistic rules and decisions governing the production of the artwork (the internal) as distinct from reflecting medical truths (the external). Gilman (1995) also discusses how historical visual representations, from a medical and health context, evidence cultural forces and this notion implicitly informed the discussion presented later in this paper.

Each germ representation was examined in turn and each new type of germ identified was added to the typology. The act of devising the typology was led by the lead

author. Co-author random dual coding (at 20%) led to an agreement level of 100% for the three emerging main categories. Further examination and discussion regarding sub-categorisation was undertaken. We obtained an 81% agreement, and subsequent discussions attributed most of the variation to images reflecting more than one of the thirteen sub-categories that emerged. It is recognized that achieving completely mutually exclusive categories within typologies is seldom achievable and is not necessarily essential for explanatory power (Macduff, 2007). This ensured an inclusive and open approach to devising the coding system. Ritchie et al (2003) argue that consideration of cases that do not seem to fit neatly within any given typological framework adds rigour to typology development and it is important to note that during dual coding no new category or sub-category was identified.

Given the often serendipitous nature of image discovery it is not feasible to accurately judge the pervasiveness of a category across time in empirical and quantifiably significant terms. Researchers used myriad discovery pathways in search of material, including visits to archives, online databases and more speculative searches. The necessarily incomplete nature of archives leads to researchers' susceptibility to the serendipity manifest in the act of initial collecting. Additionally, no archive or database is itself without biases of various kinds and involves selection of image, text and metadata as well as methods of exclusion. Notwithstanding the impossibility of considering all germ imagery in popular media and educational material in the past, we believe that our sample represents a sufficient quantity to establish a meaningful understanding of the wide visual culture of germ representation. As such the aim of the work was not to produce a definitive taxonomy but rather to build a typology with breadth, depth and potential utility.

The Typology of Germ Representations

Germ representations were found to have varied functions within the sample of images. The five primary functions are identified below.

1. Promote good hygiene behavior through inclusion in public health posters, films and animations.
2. Promote product purchase with print, web or television advertising.
3. Entertain audiences within books or comics.
4. Educate audiences on websites, books and leaflets.
5. Share germ representations through image-stock websites

Three main categories of germ representations were identified and labeled as 'Scientific', 'Carrier' and 'Analogous'. These are further divided into sub-categories that focus on dominant visual characteristics and, in the case of the third category, sub-categories of analogy. While many of the germ images included in our analysis mapped straightforwardly into just one of these large-scale categories, they frequently displayed features of two or more sub-categories. The typology can be viewed in Figure 1. Each category and sub-category is addressed in turn below.

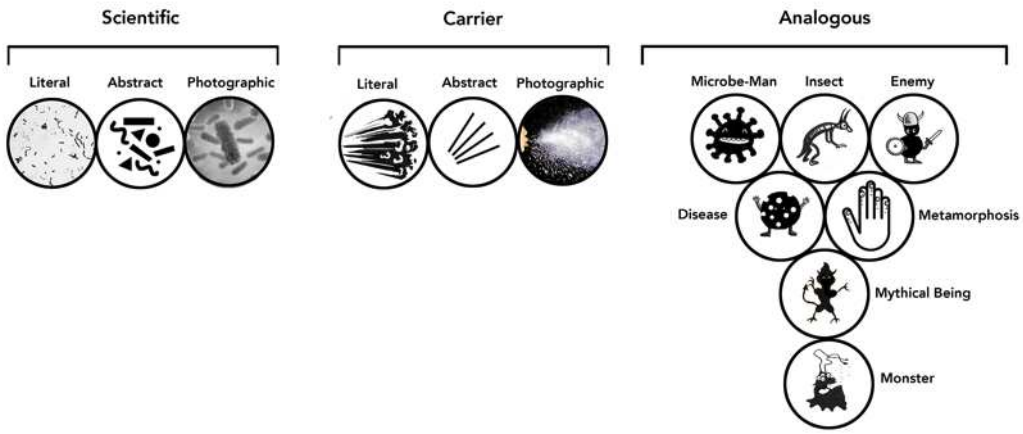

Figure 1: A Diagram of the Typology of Germ Representations

The Scientific Germ

The Scientific Germ as a category refers to germ representations that draw significantly on their congruence with germs as represented within scientific discourse. The resulting claim to scientific authority and veracity is further reflected in the modes by which the germ representation exists, e.g. labeled in educational texts and/or mediated through scientific equipment such as microscopes. The Scientific Germ category consists of three sub-categories that allude to various modes of representation – the Literal germ drawing, the Abstract germ drawing and the Photographic. Each may imply a different sense of authenticity to the viewer and be mobilized for different purposes.

The term Literal Scientific Germ refers to a drawing of a germ that mimics a microscopic image. These were commonly found in popular textbooks and early

twentieth century product advertisements. Germ representations classified within the Scientific Germ category, but particularly the Literal Scientific Germ sub-category, tend to be depicted as caught and mastered by scientific apparatus, or labeled in diagrammatic form. These germ representations may be used to furnish evidence that germs exist, are named, and, importantly, may be eradicated

The Abstract Scientific germ sub-category includes germ representations that have simplified forms of basic shapes and/or that present the germ as highly stylised. Stylisation occurs by restraining/adding colours or rendering with high levels of line control. The germ image on a Tedtalk web page, for example, (Tedtalk Illustration, 2012) features vector-based and regular shapes. The colour choice and the stroke width treatment within this image reflect contemporary graphic design styling, increasing appeal of the subject for a modern viewer and reflecting an inherent beauty within the germs themselves. The approach to image making found in the Abstract Scientific Germ category affords practical benefits. It is more convenient to label (see for instance its use in Pollack, 1998, p.232). It is also, when presented using regular shapes, potent in showing the act of germ multiplication at a glance, rendering complex aspects of the germ lifecycle more clearly visible (as in Berger, 1995, p.16).

The ‘Photographic Scientific Germ’ sub-category includes images of germs taken using a camera (infrared or micrograph) and also contains germ representation constructed and rendered in photo-realistic form using computer software. Though ontologically the photograph and the computer render are inherently different, as images they have very similar appearance properties and fulfill similar visual purposes. They both employ dye stain effects and feature high levels of detail. The trust-making function of medical/biological photo-imaging technologies has already been well recognized (Van Dijck, 2011) and these sophisticated and detailed germ representations operate as similar visual devices of authority. As such, the germ representations of this sub-category were found either accompanying news stories (see for instance Wadman, 2017) or within popular image searches for the word ‘bacteria’ (as opposed to ‘germ’) sourced from information websites such as netdoctor.co.uk. An example of this approach to germ representation is shown in the illustration by Salaman below. A photograph of a hand is shown holding a petri dish with bacterial colonies that merge into an image of the earth. The photographic nature of the germ representation adds authority and serious tone to the image, whilst simultaneously emphasizing the ubiquity of germs in the environment.

Fig 2: The impact of biotechnology on the world. Credit: Dan Salaman. CC BY-NC
https://wellcomecollection.org/works/jsgkpc75

The Carrier Germ

The Carrier Germ category refers to a germ that is visually represented by the visible materials through which it is carried such as bodily fluids and hand prints. The images classified in this category were interpreted as germ representations, rather than as representations of fluids or sneezes, due to unambiguous textual references to 'germ' or germs' close to the image. For example, in the Swine Flu poster campaign issued by the Department of Health, UK in 2009 (Lovell, 2009), an image of a man sneezing is photographically frozen in time and anchored by the phrase 'Germs. Out in a Second. Around for Hours'. The primary focus on germs within the image is further reinforced by the secondary phrase 'Catch it, Bin it, Kill it'. The singular sneeze contains, by implication, the germ threat.

The germ representations classed as Carrier Germs were most frequently found in public health posters aimed at changing behaviour. Particularly pertinent examples include campaigns targeting sneezing hygiene, such as the 1950's British posters commissioned by the Ministry of Health, and later, in various NHS initiatives during outbreaks of influenza. Three sub-categories emerged for the Carrier Germ category.

The Literal Carrier Germ sub-category includes drawn images that attempt to capture the highly viscous qualities of a sneeze or other behavior. Shapes such as clouds burst from mouths and attempt to visually capture the residue of a sneeze. These are particularly evident in post-war British posters by Bateman (see Figure 3) as well as in more recent images such as 'Germs make me sick' (Berger, 1995), where fluid droplets are visible from the mouth, emphasizing the liquid vector of the germ itself.

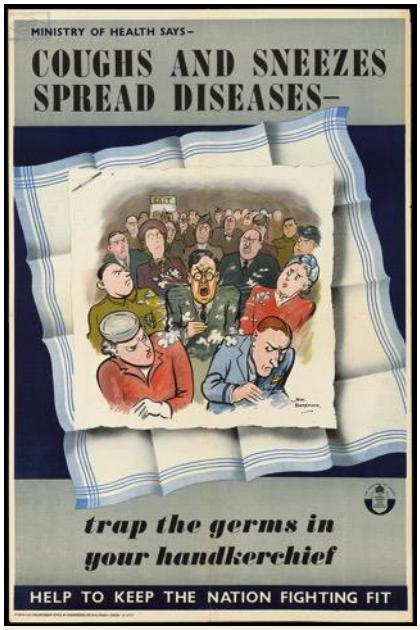

Fig 3: The use of handkerchiefs to prevent against diseases, shown by a man sneezing in a cinema. Colour lithograph after H.M. Bateman, ca. 1950. Credit: Wellcome Collection. CC BY
https://wellcomecollection.org/works/btuqzwbn

The Abstract Carrier Germ sub-category includes germ representations constructed by simplified lines and basic shapes with little textural and repellant qualities. For example, a poster designed by the Mount/Evans Studio features dots grouped to form a large black arrow driven into a handkerchief (Mount/Evans, c.1960). In a further example, a poster commissioned by the Ministry of Information warned public audiences of the dangers of not trapping germs in handkerchiefs (MOI, 1960). A figure is shown coughing out simplified lines to represent saliva. Such lines echo the features of the protagonist's face already adorned in lines of similar width around the mouth, eyes and forehead.

Within later images featured in the children's book, 'I Know How We Fight Germs', (Rowan & McEwen, 2000) a germ is represented as a series of lines and dots. Such abstract visual treatment enabled a more palatable positioning of a highly visceral substance, reflecting the breadth of appeal possible within the Abstract Carrier Germ sub-category.

Finally, the Photographic Carrier Germ sub-category includes germ representations that are highly veristic and display liquid and surface properties through use of high-speed photography (as seen in the NHS Swine Flu campaign (Lovell, 2009)). Photography is employed to capture a sneeze in slow motion, and is thus able to

represent the contents of it more explicitly. Through visual emphasis on the physicality of the germ carrier and temporal nature of germ dissemination, a greater sense of reality, and indeed disgust is suggested.

Unlike in the Scientific Germ category, germ representations in the Carrier Germ category are most often depicted with a human agent at their source. These types of representations are also often positioned within an everyday setting. For instance, a print advertisement for Peps from 1915 (Peps, 1915) features four scenes in a simultaneous visual narrative that frames the centralised text. The classroom, the street conversation, the public lecture and transit scenes are united visually by a germ-filled cloud. The use of other participants within these spaces is also significant. In mid-century posters, for instance, a moralistic tone and disapproving glances were frequently evident as factory workers and passers-by intervened or provided visual commentary on the act of spreading germs, often in a humorous manner. In more recent images by the Department of Health (See Figure 4), however, green germ representations are invisible to other protagonists in the scenes suggesting a greater sense of danger to touch points in everyday spaces such as the home and on public transport. The other protagonists in the scenes are oblivious to the germs and thus there is much less suggestion of social disapproval within later images.

Fig 4: NHS Flu Advert, 2011, © Crown Copyright
https://www.campaignlive.com/article/government-releases-new-set-swine-flu-ads/948015

The Analogous Germ

The Analogous Germ category stands as a testament to the fantasies and imagination of visual communicators. Germ representations classified under this category employ varied visual analogies. Personification also plays a key role in the category, borrowing from what we know best – ourselves. Consequently, images of this type adopt a variety of anthropomorphic characteristics, from human faces to the performance of complex human activities. Such variety demanded the creation of seven sub-categories for the Analogous Germ: Microbe-Man, Insect, Enemy, Germ as Disease, Metamorphosis, Mythical Being and Monster.

Images in the Microbe-Man sub-category present germs as personified amoeba-like characters. With facial features or limbs added, these representations can depict a wide variety of behaviours and attain vital levels of agency and expression – they can see, move, attack, flee, smile or grimace. Crucially though, in overall shape, they reference and extend the form of germs usually found within the Scientific Germ category. Images in this sub-category were commonly found in literature for children and in stock-image banks. For instance in the children's book *Dirty Bertie* (McDonald & Roberts, 2004), amoeba-like shapes with spikes and eyes float suspended only in the white sheet of the chapter-title page. Such an approach to representation is not only located in material aimed at children however. In the 1999 print advertisement by Bates of London and commissioned by vitamin company Redoxon, a photograph of a bacterium is transformed through crude drawn lines into an angry character (Bates, 1999). That the Microbe-Man approach to germ representation was commonly found within stock-image sites highlights the persistent nature of this representation and the ease of its proliferation (see Figure 5). The term 'man' is used in this sub-category to signify 'mankind' rather than 'male'. However, it is worth noting that where germs are gendered by accompanying labels, names or voices, the vast majority of the germ representations within the whole sample were identified as male.

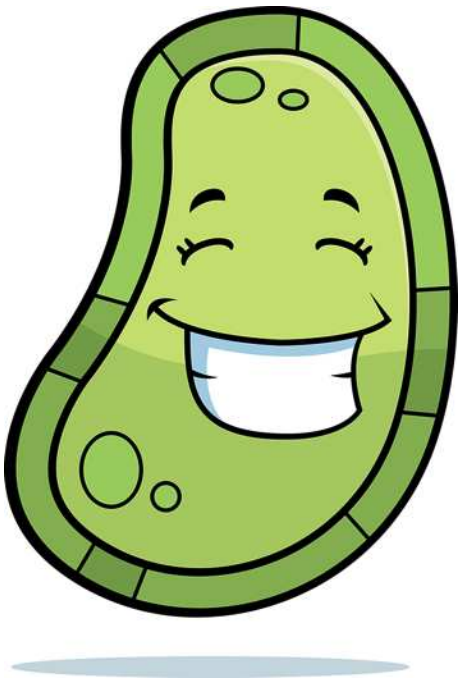

Figure 5: Illustration 11832393 © Cory Thoman - Dreamstime.com
https://www.dreamstime.com/stock-photos-germ-smiling-image11832393

The Insect sub-category refers to germ representations that resemble insect-like creatures that are often shown invading domestic settings. It is perhaps unsurprising that germs would be visually represented in this way given the analogies made with animal life from the earliest days of investigations into microorganisms when Antonie Van Leeuwenhock (1632-1723) likened these newly-visible 'animalcules' and their movements to pikes, swarms of knats and flies (Smit & Heniger, 1975). In early popular images of germs such as John Leech's 'A Drop of London Water' (Leech, 1850), microorganisms from the River Thames are shown through a microscope as fish/creature hybrids swimming in a single drop of water. The visual alignment of the fly with germs and disease became prevalent in the U.S. in the early twentieth century (Rogers, 1989). Similarly, in the UK, insect-led approaches were mostly found in material from the early and mid-twentieth century. Over-sized insect-like characters such as Giro the Germ (1927), the ant-like invaders within Giles' posters (Giles, 1940s) and the insect-like forms featured in newspaper advertisements for JeyPine in the 1950s represent an uneasy relationship between domestic space, the microscopic world and the animal kingdom. The JeyPine germs (Jeypine, 1951), for instance, appeared in British newspapers from 1949 to 1954 and featured black, antenna-topped and wide-eyed creatures with claws for hands and barrel-like striped bodies. The germ appeared as just another pest to kill. The germ representations within the Insect sub-category took more sinister rather than comical form in later images. For

example, the print advertisement for 'Just Liquid' soap (Euro Rscg Mumbai Agency, 2007) features a photograph of a mother's hands covered in cockroaches reaching for her young baby. This striking image highlights the continued alignment of 'filthy' insects and their connection with dirt, danger and infection.

The Enemy Germ sub-category of the Analogous Germ is used to describe representations that feature germs as 'undesirable' citizens or enemies to society. The enemy presented in these images may reflect contemporary societal or political issues or represent a timeless vision of a generic military invader. Brown (1997) discussed how images in the United States, abhorrent as this might seem, often aligned germs or dirt with uncivilized, undesirable or marginalised communities and races. This is reflected in UK images also. In the stop-motion animation Molar Mischief (1946), for example, three germs are represented as criminals dressed in striped tops with crude and anti-Semitic facial features: long red noses, large ears, bulbous eyes and Nosferatu-like extended fingers. This analogous approach functioned bi-directionally in the wider field of visual culture in the UK in the early twentieth century – germs were represented as the enemy and in some cases, the enemy was represented as germs. For example, *Punch* magazine's predominantly humourous illustrations featured germ imagery which represented undesirables of the time, including suffragettes (see Anon, 1913).

According to Worboys (2000), the military metaphor of invading germs came to the forefront of discourse in the 1880s, with prominent British bacteriologists in the tradition of Robert Koch hailed as 'microbe hunters'. The outbreak narrative of germs suggested by King (2014) focuses on contagion and invasion and this relates closely to the concept of the Enemy Germ sub-category presented here. In the UK, most notably during the Second World War, germ representations in public circulation embodied the notion of the military enemy. For example, germs were represented as German troops in Philip Mendoza's (c. 1940) 'Germs love a open wound' poster (see Stark & Stones (2019) for detailed elaboration). A series of posters dating from 1939 to 1945 represented the germ as an easily identifiable military enemy, drawing on earlier expressions of conflict between the body and germs.

This enemy trope is also evident within later twentieth century and contemporary germ representations denoting its continued application outside times of major conflict. Later these representations, however, strip political resonance from the enemy. By presenting germs with swords, shields, Norman-style helmets, eye patches or pirate

flags, they become protagonists in a timeless and generic battle, rather than drawing visible parallels with particular ethnicities or cultures. This type of germ representation was found to be present in its most persuasive form in children's books. For instance, the book *I know how we fight germs* (Rowan & McEwen, 2000) features a 'pirate' germ, identifiable by the eye patch, on the front cover with 'Sam', the heroic main protagonist, armed with his sword. In *Germs* by Ross Collins (2004) the war metaphor is sophisticated in its variety and charm - germ 'cadets' learn to fly, trained in medicine 'self-defence' and sent on a 'mission' led by Commander Phlegm bearing medals on his chest. Images classified with the Enemy Germ sub-category adopt such an approach to create narrative tension potentially rich in conflict and action.

The Germ as Disease sub-category refers to germ representations that visualize specific symptoms of a disease. For example, a Linctus Cough Mixture television commercial (Fletcher Shelton Delaney, 1986) features a visually diverse set of coughing characters that seamlessly morph into each other. The process only halts with the appearance of the commercial product. Each germ character has unsightly features - disordered spikes, bumpy skin, irregular teeth and distressed expression - though each possesses a unique shape and movement to reflect each variety of cough. Similarly in a series of television commercials for Askit powder (Chetwynd Haddons, 1980), an influenza germ is shown lethargic and shivering. A germ image representing cold-like symptoms drips onto the screen. More recently, in Collins (2005), the key germ characters feature physical symptoms such as bumps (for mumps) and melting drips (for a common cold). Germ representations that visibly feature physical outcomes of disease add biological drama to the scene and tighten the germ-disease relationship for viewers. These germ representations simultaneously function as both cause and effect.

In the Metamorphosis sub-category, an object metamorphoses into the germ or vice-versa. In the 1960s British designer Reginald Mount produced a poster for the Department of Health in which germs were represented by fingers (DOH, c.1960). As a deceptively simple yet potent image it featured a set of angry faces drawn on a photograph of fingers. A number of more recent images featured germs as the hand. For instance, in a campaign commissioned by Kimberly-Clark photographed fingers were painted to become monsters with cleverly combined tentacles or jaws (Ogilvy, 2010). As a visual trope it reflects Delbaere et al's (2011) fusion and replacement theories of the image in advertising, in which the germ and the human and/or the

environment become inseparable and indeed interchangeable. This proximity that the metamorphosis technique affords aids a direct connection between humans and germs, turning the body, and particularly the hand, into the threat itself.

Analogous Germs may also play the role of devil or demon as identified by pointed tails and horns. These germ representations are classified as a Mythical Being sub-category. In historical accounts of disease, supernatural agents played the role of the modern-day germ (Keil et al, 1999). The conceptual combination of demonology with germ theory provokes an unusual visual alignment of supernatural and scientific concerns. An adhesive sticker produced for display in staff toilets during the 1960s by the Central Council for Health Education features a demonic germ rising through the tissue paper as if rising from the dead in vampire-like fashion (Figure 6).

Figure 6 © 'Wash your hands when you leave' Sticker, 1960-1970. The Board of Trustees of the Science Museum (https://creativecommons.org/licenses/by-nc-sa/4.0/). (https://collection.sciencemuseumgroup.org.uk/objects/co8179422/sticker-relating-to-hygiene-and-cleanliness-london-england-c-1960-1970-sticker)

The impish figures within the short film Giro the Germ (1927) featuring bucked teeth, pointed head shapes and hunched stances, suggest devilish menace, as do the two black figures with pointed tails and claws that lurk behind a coughing figure on the cover of a tuberculosis leaflet from the early twentieth century ('How to watch out for TB', c.1955). The Mythical Being sub-category also includes more mischievous fairy-

like and troll-like figures. For example, in point-of-sale ephemera from the early twentieth century for Dr Bengue Balsam ('Find the hidden germs', c.1935), germs appear hidden in tree bark, featuring long-nosed and troll-like faces. A print advertisement in *Homes and Gardens* (Electrolux,1926) depicted germs as fairy-like creatures and described them as 'dusties', with a clear implication that they were to be found in homes where hygiene practices were imperfectly observed. More recent examples reflect similar notions. For example, in the children's book *I know how we fight germs* (Rowan & McEwen, 2000) germs with small horns are shown fleeing from a scene. In 1985 the ZX Spectrum computer game 'Gerry the Germ's loading page featured a central blue figure emerging in front of the 'Institute of Infectology' with protruding frontal sharp teeth and two horns on the top of its head. In *Germs Make Me Sick* (Berger, 1995) germs are depicted rising, in nightmarish fashion, out of the darkness from the side of a child's bed, captioned 'We're coming to get you'. Tomes (1998) suggested a link between the supernatural and disease based on textual descriptions of tuberculosis from the early twentieth century. Through detailed inspection of germ images we are able to show this was evident too in images circulated, and still circulating, in the UK. Keil et al (1999, p.299) stated that "talk of supernatural agents or natural courses are neither mutually exclusive nor necessarily contradictory. One can fill in the gaps left by the other" and these representations are, perhaps, visual embodiments of this notion.

The Monster Germ sub-category includes personified creatures that present monstrous visual properties that extend beyond microbial form to display unsightly features such as deformities, spikes, rotten or irregular teeth, sprouting hairs, obese bodies and viscous surfaces. The etymology of the word 'Monster' originates in both the word meneo (to warn) and monstro (to show forth) (Picart & Browning, 2012). Thus, by definition alone, germ representations within the monster sub-category appear, initially, to be the ideal visual approach to provoke fear of invisible germs. A print advertisement for Domestos (DLKW Lowe, 2015) shows a germ in grotesque, monstrous form imbued with bodily deformities such as three breasts, seven-digit hands and bulbous eyes. It swims underwater in a direct parody of utopian-like, photography-based holiday advertisements, anchored with text that reads – 'The holiday's over'. The spectacle of the germ's appearance, made salient through photo-realistic 3D rendering, adds to the compelling nature of the image.

In some ways, the Monster sub-category is perhaps the most controversial of the typology. Germ images that are classified within it reflect a subversive reversal of the physical ideals of the body beautiful. Of particular note is the persistent use of the green, obese monster that signifies lack of fitness, with pock-marked or slimy skin surfaces, and irregular features to enhance a state of disgust. This approach to fictionalising the body of the germ is evident in a number of germ images sourced from stock image sites. These are repositories of significant cultural meaning and cultural reproduction (See Machin (2004) for more detailed discussion). The rendering of these 'monsters' suggests the new germ enemy within society is obese, deformed and ugly. This sub-category acts as a visual commentary on the ever-present difficulty in accepting the non-beautiful body within Western culture. By aligning these visual qualities with germs, it acts to stigmatise them further and align illness with ugliness. To 'monsterise' is also to fictionalize and thus this particular trope, when used in popular educational literature for children for example, is problematic. We are told monsters are fictional but that germs are real. Their combination therefore could creative cognitive dissonance or disbelief.

Cultural Forces influencing the Analogous Germ

We argue here that the use of personification, highly evident within the Analogous Germ category, is a result of four complimentary cultural forces utilized to both positive and negative effect – the Imagined Unknown, Political-Cultural Control, Commercial Persuasion and Magical Contagion.

The first cultural force impacting upon germ representations is, to paraphrase Stewart, 'the longing of the miniature'. She states that *"…to reveal a set of actions and hence a narrativity and history outside the given field of perception – is a constant daydream that the miniature presents" (Stewart, 1993, p.54).* Germ representations attempt to make visible an invisible miniature world. Like many invisible representations (having no physical form or not commonly encountered) personification occurs in an attempt to make the unknown more familiar (such as the inclusion of human-like creatures in early medieval maps). Human creativity populates the inadequacy of our vision (be it earthly or spiritual) with ourselves and this is one way by which we may account for the myriad analogous approaches to germ representations found. Stewart (1993, p.44) also discusses the child's embrace of the miniature as a continual metaphor "limited in physical scope yet fantastic in its content". Images within the Analogous Germ category often serve to populate children's imaginary worlds. Germs infiltrate castles and caves with miniature props or subvert/adopt domestic spaces. The toilet

becomes a huge theme park or a pen transforms into a cannon (Boots, 1935). Germs are presented as the size of fingers, insects, small animals and, crucially, of toys. Germs, therefore, are presented in a world that children already inhabit – they are discoverable and therefore potentially controllable. The germ escapes the confines of the microscopic slide in representations (evident in the Scientific Germ category) and instead populates an imaginary parallel world in domestic space. It is this very fascination with the miniature world that has also initiated contemporary creative responses (see for instance the interview with Drew Oliver, founder of Giant Microbes (Jermy, 2016)). However, that the viewer may see a humourous and appealing visual approach within the presentation of harmful bacteria poses an important issue for health communicators more broadly. Should the viewer take delight from the presence of germs and invisible worlds? What role does imagination play in situating the potential danger of germs if, particularly for children, the germ character mirrors the very activities they themselves partake in? Thus arises a potentially difficult dichotomy between danger and delight.

The second cultural force, political-cultural control, seeks to align germs with the socially undesirable. The impact of this force is most clearly shown in the Enemy sub-category discussed above. Brown (1997), studying American representations of germs from 1870 to 1950 related the germ body to the criminal body. It was through the diffusion of such images in relation to hygiene, Brown (1997) argued, that systems of cultural power were covertly reinforced and in turn, reproduced. The promotion of hygienic practices – both physical and moral – was very much at the forefront of public health propaganda. In the United States for example, marginalised Black, Jewish and Slavic communities were aligned, shockingly and unacceptably, with germs and dirt (Brown, 1997). As shown through the identification of an Enemy Germ sub-category this political agenda was also evident in historical images within Britain. Today, political-cultural control appears evident in the use of the Monster trope whereby deformity, obesity, poor dental hygiene and ugliness become, abhorrently, the new dangerous enemy of society.

The third cultural force relates to the field of persuasive communication and in particular, the use of spokes-characters. The Analogous Germ category features germ images that are actors within a wider persuasive framework. Such germ images act as a visible prompt to change hygiene-related behavior or promote product consumption. In Callcott & Lee's (1995) typology of brand spokes-characters, broad classifications were made that relate, in part, to the germ typology

presented here but with a necessary focus on positive attributes.

The Analogous Germ images examined here cannot be classified as spokes-characters per se given the definition of Callcott & Lee (1995) - a spokes-character must be used consistently in relation to the product. Mostly the germs changed form frequently across campaigns and in germ narratives. If we can position germ representations in relation to the well-established notion of the spokes-character it may be classed as a product/behaviour 'opponent' – a symbol that facilitates the dramatic demonstration of the product's or the behavior's powers. Stern (1988) highlighted how crucial historical perspectives are to understanding the use of personification and spokes-characters in contemporary advertising. By connecting various medieval allegorical qualities to more current advertising strategies she presented a compelling argument in which she compares the medieval "masses" to the modern mass market. She identifies three factors that can be related tightly to the germ representations presented here. Use of metaphor, conflict and personalisation are, Stern (1988) argued, important for increasing the effectiveness of persuasive communication. Delbaere et al (2011) cited a number of empirical studies showing how rhetorical figures induce higher levels of elaboration by the viewer and this makes a compelling case for using an analogous germ approach within persuasive material.

The final cultural force that accounts, in part, for the potential power of the Analogous Germ category is magical contagion. Magical contagion is a principle established by nineteenth century anthropologists (E.B. Tylor, Sir James Frazer and Marcel Mauss) (Rozin, 1989) that is used to rationalise certain traditional cultural practices and rituals. The principle states that objects and any kind of contact may pass on negative or positive properties and that these are reliant on the recipient's *feelings* towards the donor. In studies (Rozin, 1989; Nereroff & Rozin, 1994) this principle of magical contagion was found to be influential in the modern Western population. A study (Nemeroff, 1992) showed how attitudes to germ contagion related to the person from which the germ came. Nemeroff (1995) also showed how an influenza germ was statistically more likely to be drawn in threatening form when caught from a disliked person than from a lover. Magical Contagion, then, as a concept is important to this study since it acknowledges the role that dislikable characters play in our concept of dangerous germs. As such it may subconsciously account for the deliberate and continued visual alignment of disliked archetypes – the devil, the insect, the military enemy and the monster – with germs. Whilst an adult audience could find the

analogous association childish this alignment may well serve more powerful functions at a fundamental, or subconscious level.

These four forces, it is argued, influence the persistence of germ images residing in the Analogous Germ category. These forces may be situated within the viewer (through the principle of magical contagion), within society at large (evident in political-cultural ideals), within commercial imperatives (the use of spokes-character opponents) or a deep-seated and delight-laden dialogue between the designer and the viewer (accounted for through the longing of the miniature).

5. Conclusion

This study presents the first typology of popular germ representations to aid further academic analysis and design practice. This typology was based on the categorization of 240 germ representations and presented three main categories and thirteen sub-categories of germ image. The three categories evidence, we argue, three layers of germ worlds – the microscopic domain of the scientist, the everyday domestic space through which the germ is carried, and the fantastical, imaginary world of the miniature that is dramatized, personified and laden with analogy. The typology of germs represents an enormous variety of visual forms. Important to note is that the typology does not necessarily dictate a singular use of categories within one text: a germ may be visualized both as an enemy and an insect; it may be a monster-like disease-symptom or a monster-like microbe-man. Hence the typology classifications are building blocks for understanding more complex germ representations.

Whilst both Tomes (1998) and King's (2014) work is useful for considering the visual representation of germs, binary distinctions lack the subtlety necessary to capture the full range of persistent practices. We have shown not only how familiar discourses related to political/cultural germ representations in the U.S. were manifest in the UK also, but argue in addition that the monsterisation of the germ images serves to relate, somewhat uncomfortably, germs to obesity and deformity. We have also highlighted a visual association between germs and mythical beings that previously was mainly discussed in relation to works of fiction.

We have also aligned the analogous approach evident in germ images with four broad cultural forces that, we believe, account for the continuous adoption of such tropes across the 118-year time period examined. For instance, none of the analogous sub-

categories identified were unique to a particular era and all were found to be in continual recirculation.

We have examined singular images in this study but believe germ narratives to be a rich area of future research. Further research could also examine the commissioning and production process of germ representations. Germs are culturally bound and culturally dependent. This study focuses on representations found within Britain though we acknowledge there is much work to be done internationally.

The new typology that emerges from this study has three vital further applications. Academically, this typology facilitates the systematic questioning of persistent design practices – what is the further significance of these particular tropes in relation to detailed analysis of historic or contemporary ideologies? Secondly, in terms of market research, the typology may be used as an underpinning research structure for attaining audience response and understanding. How do germ images utilising an analogous approach, in particular, continue to influence the audience emotionally and cognitively? Do continued dominant tropes lose their effectiveness? Finally, this typology informs graphic designers, illustrators and commissioners, with immediacy, of the range of pervasive approaches to germ representation already in existence. This can, in turn, we hope provoke new creative practices and reflections.

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