Crowds

Like many CEOs, we imagine that we are in charge of all that we do. So, just as many CEOs would boast that they make decisions for themselves without being swayed by the changing mood of individual directors, we might not be aware of being taken over by our interbrain connection, although we are often more able to observe its effects.[*] These are most obvious when the interbrain connection is strongest or when our narrative self is weakest. An obvious candidate for a strong interbrain connection is being tightly packed in a crowd and being open to connection with the others with us. So not in a crowded train where we are trying to find our little space, or on a crowded beach where we are trying to feel as if we are on our own with our nearest and dearest, but in a demonstration or at a football match where we are proud to identify ourselves with our fellow supporters or demonstrators.[†] Sartre, the philosopher of everyone who feels lonely in a crowd, imagined what it would have been like to have one of the sans-culottes storming the Bastille at one of the high moments of the French Revolution. He described this as a moment of fusion in which each person thought that it might be them or it might have been someone else who cried 'à la Bastille'. Individual awareness was dissolved

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[*] The idea that our self-awareness plays catch up with our actions, providing justifications for them only after they have been initiated, was first proposed by Wegner (2002).

[†] This notion of giving in to being a part of a crowd by adopting a shared social identity has been developed by Reicher, Spears, and Postmes (1995). It does not quite do justice to the force of crowd intoxication that can catch up people who would think themselves resistant to it, but it does give weight to the inevitable corollary of the crowd, that at a certain stage of its development one might side with it, or set oneself apart from it. If the latter, one becomes, more often than not, the crowd's potential adversary.

in the hysteria of the crowd or, as Sartre himself put it, in the 'constellation of mediated reciprocities'.[7]

Crowds have been the subject of a considerable literature, but the concept of crowd psychology probably originated with Le Bon.[8] His treatment may have been influenced by his viewpoint, a condemnatory one, on the Parisian crowd during the second Paris commune of 1871. Le Bon anticipated that the 20th century would be the age of the crowd and that individuals who could dominate crowds would be the new kings and rulers.

Le Bon thought that crowds had three main characteristics:

- 'the disappearance of conscious personality'

- 'the turning of feelings and thoughts in a definite direction' (and of course the same direction for each person)

- 'being brought together'.[9]

Deindividuation

Le Bon's idea that crowds are characterized by the 'disappearance of conscious personality' is the reason that I have started with them as one of the manifestations of interbrain communication between people. People in crowds may lack conscious personality but they do not lack drive or feelings, even though they do share them with everyone else who is part of the crowd. This 'deindividuation', as it has come to be called, continues to be recognized as a common denominator of crowds of people.* Sartre referred to it as 'fusion'.

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* This 'deindividuation' hypothesis (Festinger, Pepitone, and Newcomb, 1952) has been extensively tested (Diener *et al.*, 1980) and the correlation between immersion in a crowd and reduced self-consciousness has been upheld. Le Bon's

There was a movement against this deindividuation hypothesis in the 1960s because, it has been argued, it ran counter to a sociological and political conception of the public, or groups of the public, being composed of autonomous agents.* Some current researchers have criticized the word because, they argue, there is no loss of identity in a crowd but only a shift from a personal to a social identity.† But this shift is a crucial one because it is a shift from an individual with a personal story who is separate from others to an individual who is fused with others and in whom, as I argue, the interbrain connection with others is potentially very strong. Just being placed in a crowd does not mean that one automatically becomes part of a crowd (notice our customary shift to the metaphor of the crowd being the whole and a person being a part). Each person in the crowd has some power to focus more on themselves or more on other people, which influences the amount of deindividuation that they experience. Crowds are also more immersive, or perhaps we are more willing to throw ourselves on the protection of numbers, if there is an external

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corollary hypothesis, that this would always lead to disinhibited and therefore aggressive behaviour, has not (Reicher *et al.*, 1995).

* Borch (2012) provides a wide-ranging account of the ups and downs of this argument and of why sociologists no longer seem so concerned about the crowds that fascinated the father figures of their discipline such as Tarde, Taine, Simmel, and Durkheim.

† Reicher *et al.* (1995) argued that deindividuation removed one kind of self but left another 'level' of self-hood ('the social' or 'collective identity') reinforced. Many might think that a collective identity falls short of what might be understood as self. To say that 'I was there, ourselves' is not a coherent statement.

Deindividuation is increased by group collaboration. Bowman compared two experimental groups, one that had completed two exercises requiring their cooperative completion of tasks and one that did not. The former scored lower on tests of self-awareness than the latter and were twice as likely to go to help the experimenter who had appeared to hurt himself in a fake accident as the latter group (Mayer *et al.*, 1985).

threat. The greater the nonverbal communication between parts of the crowd, the more immersive it is, too. As nonverbal communication is enhanced by similarity, more homogeneous crowds are more immersive. Nonverbal communication also gains weight when there is reduplication of the same expressions or movements in different bodies. So the larger the crowd that one is immersed in, the more deindividuating it is.[*]

Although for the purposes of contrast I am going to be focusing on crowds that make extreme demands of their participants to deindividuate, in many situations the narrative self may partner with the interbrain to create a willing immersion in a partly imagined crowd.[†] This is most clearly

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[*] More recently, Reicher and colleagues have shifted from considerations of individuals' self-awareness to the social context of the crowd. Proponents of Reicher's Elaborated Social Identity Model (ESIM) have emphasized the role of opposition, particularly opposition from the police. In one of the more recent studies of ESIM (Van Hiel *et al.*, 2007), the 'measures' of social identity used were two statements that participants (football fans in Belgium before a match) were asked whether or not to endorse: 'I am proud of our side' and 'I resemble the other members of our side'. The idea is, I think, that individuals choose to align themselves with the other members of the crowd, as opposed to earlier ideas that the crowd controls the individual. My own view is that both may happen and that there are crowds based on shared ideas and those based on shared emotions. The latter can subvert individuality if the shared emotions are strong enough. On the other hand, self-focus opposes deindividuation. Even the presence of a mirror may be enough to increase self-focus in children (Ross, Anderson, and Campbell, 2011) and thereby increase individuation.

[†] It might seem to be special pleading to argue that the imagination can supplement the interbrain, as I am so firmly asserting that the interbrain requires person-to-person contact sufficient to enable mimicry and emotional contagion. Sight or sound of other people, even when recorded, may afford some one-way traffic of that kind, but not text – the usual social medium. Text is the medium of 'theory of mind' or narrative. I am also arguing that interbrain connections are anterior to reflective cognition, whereas imagination is clearly reflective. I have set out a possible way that imagination of interbrain communication might work in the chapter on 'cacheing' in my book *Can the World Afford Autistic Spectrum Disorder?* (Tantam, 2009). I argued there, and will argue later in this book, that we memorize a great many of our interactions with other people, at least in a schematized way. We are able to recognize other people's faces, their clothes, or even their homes.

seen in internet-based crowds where extremes of grief or enthusiasm are exchanged on social media.*

Organismic analogies

Le Bon, who was medically trained, approached the psychology of crowds as a psychopathologist. He anticipated many of the subsequent observations of crowd behaviour, and it was from the point of view of a doctor viewing a patient. For example, he described 'ideas, sentiments, emotions, and beliefs' infecting crowds like microbes. He wrote that the spread was a kind of contagion and that it was spread not by the transmission of an infectious agent but by imitation, but did not explain further why imitation would be so powerful and would result in individual thinking being dominated by imitation of others –

We also remember their facial expressions sufficiently well that we can notice if they are not their usual ones. It is a perfectly meaningful expression to say 'You're not looking yourself today' using some kind of internalized image as the comparator. We can also tell ourselves or others, 'I can just imagine what he would look like if I wore that', and be put off our stroke even by the image of that thunderous brow or lecherous eye. So we have a plentiful stock of memories of embodied interactions that can be activated by our motor rehearsals. In this way, some of the features of interbrain communication can be preserved with people who had made a strong person-to-person impression, even when those people are not physically present any longer. I called this store a 'cache'. The cache is of limited capacity, and so its memory of particular interbrain connections gradually fades and needs to be replenished.

Another way that memory amplifies the interbrain connection is through familiarity. As interactions with a particular person take place over time, and emotions become associated with them, the interbrain connection with that person becomes more readily established and persists for longer. Interactions become subsumed into relationships and they develop a valency of liking and seeking out interaction or disliking and avoiding it (Scheidel, 2017).

I do not really consider these more complex features in this book, else it would turn into a social psychology textbook.

* The internet also enables the opposite process, of hyperindividualism, exemplified by the troll who cares nothing for received opinion except to insult, mock, or otherwise gainsay it.

it has taken a century for the explanations that I have alluded to in Chapter 1 to be worked out.[*]

Our vocabularies include numerous singular names of collectivities with multiple members. This makes it easy for us to talk of many people or animals as if they have a single mind. We can say that the flock of sheep panicked and ran down the hill or that the shoal of fish veered away from the sinister mouth of the grouper. For a variety of reasons, some trivial, some much more serious, engineers, IT specialists, animators, and others have become increasingly focused on what holds such collectivities together. This is how a programme developer describes the development:

> Animals flock, swarm, herd,[†] school, pack,[‡] and, also, crowd. Some of them have specialized means to ensure that they act as one when they do so. More and more of these behaviours are being investigated, often by creating models or rules that can be instantiated by robots or virtually, by a computer program that creates virtual agents that follow simple rules or a robot or 'boid'.[§]

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[*] Le Bon's contagion model is described in Le Bon (1930/1896). A regrettable implication of the model was that psychiatrists might catch madness from their patients, and Le Bon, in a rare moment of questionable judgement, commented as evidence of this that '[t]he frequency of madness among doctors who are specialists for the mad is notorious' (Le Bon, 1930/1896, p.73).

[†] Zhang *et al.* (2016) use 'herding' to refer to clumping in crowds, for example around one water supply when there are others that are underused nearby.

[‡] Canetti (1984) uses pack for 'a group of men in a state of excitement whose fiercest wish is to be more' (p.93) and says that it does not need a leader, as each of the members of the pack shares a direction.

[§] Boids are virtual birds, so named by their inventor Reynolds (1987).

It is assumed that if boids can be programmed to flock in a life-like way, the rules that each boid implements may give clues to the biological principles behind flock behaviour, including human-crowd behaviour. 'Keep together' and 'avoid collisions' both seem universal, but rather obvious, examples.[10] More complex algorithms have developed spontaneously in social insects, enabling swarms to perform complex behaviour without a leader. Termites build ventilation systems, and honey bees have developed a logistic system for exploiting nectar and pollen sources with the greatest effect, despite the numbers of active worker bees varying. This, the honey algorithm, has been applied to server traffic management,* reportedly increasing the efficiency by a quarter,[11] and all of it based on the behaviour of swarms of worker bees communicating with each other by means of 'waggle dances'.

In the 19th century, crowds were assumed to be a danger under all circumstances, and public gatherings over a certain size were often proscribed. One example, etched into 19th-century English history, is the proscription of crowds protesting the repeal of the Corn Laws. Despite this law, a large crowd gathered in Manchester and the local military commander gave the order for the militia to fire on it in order to disperse it. This 'Peterloo massacre' brought down the government, but did not stop other governments in the UK and abroad from enacting similar regulations about public assemblies.

The same distaste extended to people's behaviour in crowds – or as I would say, to the behaviour of people whose interbrain connection with each other is more active than their

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* The banks of computers that handle requests from users linked to them via the internet who may be requesting search results, their bank account details, or a weather forecast have to shift these tasks about between themselves so as to be most efficient – this is called 'traffic management'.

narrative connection. Sidis, for example, wrote this in 1903: 'This subconscious or subwaking self is regarded as embodying the "lower" or obviously brutal qualities of man. It is irrational, imitative, credulous, cowardly, cruel, and lacks all individuality, will, and self-control.'[12,*]

Today, crowd behaviour is being studied from a less fearful perspective, partly because governments have again embraced the governing principles of Roman emperors: that cities are safer when you provide 'bread and circuses' (although smaller crowds, or 'gangs', continue to be a challenge to security). Sports, entertainment, and the vicarious participation in 'events' have become, once again, stabilizing rather than dangerous features of city life because the crowd experience is rewarding.[13] Studies of crowds focus, in consequence, on crowd management as much as on crowd dispersal.[14]

People enjoy crowd participation

Crowds enable emotional contagion that has an amplifying effect on the emotions of anyone in the crowd who is not opposed to the prevailing mood. Individuals who enjoy a particular performer or who follow a particular team and are caught up with joy or sorrow in the performance experience this as consummatory, an effect that Aristotle attributed to catharsis.[†]

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* Sidis (1903) is clearly influenced by Sigmund Freud, as his formulation of the unconscious as the residuum of our animal nature and of the importance of hypnosis in uncovering it are consistent with early Freudian theory, although Freud had, by 1903, turned away from the idea that hypnosis could uncover the unconscious, having come to believe that it increased resistance to unconscious expression, not diminished it.

† Catharsis involved building emotion and then releasing it, a process that Aristotle thought could be induced by watching emotions enacted in a tragedy

Surprisingly, there is a lack of information about whether there are more immediate rewards to being in a crowd[*] and, by extension, immediate rewards to opening up the interbrain connection. This may be because social interaction is potentially dangerous as well as potentially rewarding. Proximity to another person can be a challenge or a comfort. Eye contact can be a threat or an invitation.

Primate groups deal with this ambivalence in two ways, by differentiation or fission[15] and by grooming. Differentiation means separating from candidate group members that might be challenging or threatening. Its effect is to create an out-group that becomes the repository of difference, conferring a property on the out-group and its members that might be called 'alien', 'foreign', 'strange', or simply 'other'.[†]

Interbrain connection with 'other' groups is minimized compared with the connection with in-groups, perhaps for the very simple reason that reading nonverbal expressions in familiar others is quicker and more accurate than with unfamiliar others.[‡] Defining someone as a member of an out-group increases the risk of conflict with them[§] and is often a

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(Straton, 1990), and there is some empirical evidence for this (Rennung and Göritz, 2015).

[*] See Godman (2013) for evidence on this point.

[†] More examples of 'othering' are provided by Çelik, Bilali, and Iqbal (2016).

[‡] But also because of the lingering effects of blame for the past, even if the past is the past of previous generations (Yang *et al.*, 2014).

[§] Family cohesion reduces adolescent involvement in sectarian conflict (Taylor *et al.*, 2016) and enhances task performance requiring collaboration (Schouten, van den Hooff, and Feldberg, 2016). Cohesion and conflict are reciprocally opposed. In group therapy, a setting in which cohesion has been studied as an important therapeutic factor, excessive cohesion can result in the group becoming stagnated, with any disagreements being suppressed and the separate development of individual group members being stultified.

precursor to denigration,* but including someone who is in conflict with the in-group may increase the threat to the in-group and lead to its dissolution.

Grooming establishes and cements the in-group in many primates. It is associated with the release of oxytocin,† with activation of the amygdala and down-regulation of the threat receptors there, and also the release of endorphins associated with pleasurable sensation. Being disconnected from an in-group causes pain.‡ Grooming also served the function of removing ectoparasites, but this function has largely disappeared from human groups, although European travellers sent back messages that the Mongols they met ate lice and fleas,[16] which may have been a misunderstanding of ectoparasite control in domestic Mongol groups. Ectoparasites must have been a major irritation in peoples who lived in close proximity to horses and dogs and who dressed in furs. Mongols were also tolerant of people who were willing to become sub-servient to them and join their in-group and notoriously

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* There is a considerable literature on this, including many publications by Haslam and colleagues, for example Haslam and Loughnan (2014). Gutsell and Inzlicht propose that the in-group and out-group distinction applies to a very early stage of processing. Desynchronization of the EEG over the supplementary motor cortex occurred during an action and when a person was watching another member of their in-group performing that action, suggesting the activity of mirror neurons. When a member of an out-group performed the action, there was no EEG desynchronization (Gutsell and Inzlicht, 2010).

† Oxytocin is closely related to the very similar nonapeptide vasopressin, but it is possible that they act as antagonists in some circumstances and that vasopressin increases distancing from an out-group, just as oxytocin fosters inclusion in an in-group. Mancke and Herpertz (2014) provide some indirect evidence for this. Gastrin-releasing peptide is also an oxytocin antagonist (Kent *et al.*, 2016), but it has not been much studied up to now.

‡ See Eisenberger (2012). The pain is similar to that associated with activation of the insula and so is possibly linked with the pain of being shamed ('punched in the gut' as people sometimes describe it) or being disgusted or wounded (Masten and Narayan, 2011).

savage to those who they perceived as belonging to an out-group. This is possibly another consequence of the importance and regularity of clan members grooming each other.

Grooming persists in the 21st century but more often with a focus on improving personal appearance, reducing arousal ('relaxation'), or as part of sexual foreplay. It usually involves skin stimulation, which at a certain level of intensity and rhythmicity results in the release of endorphins and a sense of pleasure.[*] Shared laughter and probably other vocal aspects of social interaction can also increase well-being, possibly by the same pathways that grooming activates.[†]

Swarms and mobs

Alongside the perception that crowds are necessarily dangerous is the judgement that they are always stupid or rather that people become stupid in crowds. Here, it is important to think a little more about what a crowd is. There is the crowd described by Le Bon, which for the sake of clarity I am going to call a swarm.[‡] This is the crowd most spoken of in past discussions of crowd psychology and is considered to be irrational or 'stupid'. Swarm members follow leaders readily, a phenomenon that seems to echo the behaviour of

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[*] See Nummenmaa *et al.* (2016). Skin contact also reduces distress caused by pain (Inagaki and Eisenberger, 2012).

[†] See Dunbar *et al.* (2012). Evidence for call exchanges between affiliated Japanese macaques as a kind of 'grooming at a distance' has been provided by Arlet *et al.* (2015).

[‡] It's difficult to find a 'good' word for this kind of crowd, as every possible synonym has a pejorative quality, precisely because membership of this kind of crowd is thought to induce irrationality and inhumanity. I am choosing swarm because it is the social unit of many Hymenoptera whose social organization requires olfactory and non-communicative networks with some formal similarity to the interbrain that I am discussing.

a person who has been hypnotized, as Trotter observed at the beginning of the last century and as has been repeatedly noted since.[17] Members of swarms are often said therefore to be suggestible. Members of swarms do not deliberate or plan but follow and obey. To make swarms do anything without a leader is difficult, and their behaviour with a leader is usually a reflection of the leader's personal agenda rather than action produced by the interbrain itself.

What makes a large co-present group of people into a swarm is high emotion that spreads through the group. This requires that a sufficiency of people in the group are disposed to feel that emotion. Unless the emotion is one that is linked to movement, the fact that a group has turned into a swarm may not be obvious. The feeling of cohesion that a great musical performance produces in a crowd, for example, is a moment of swarming that may not be recognized even by those present.[*] But if the emotion is one that is linked to movement then the swarm is disclosed. Three particular movement-related emotions are: adoration, when each member of the crowd wants to touch the object of their adoration; terror, when the movement is away from a threat or towards safety; and rage, when the movement is towards removing the source of the rage. I discuss terror at some length later in the book.[†]

There is another type of crowd that is drawn together by shared knowledge. This is the kind of crowd that used to sit outside department stores the day before their January sale was due to open. There was a camaraderie there and a readiness to share knowledge about which department had

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[*] Swarms also play a role in the redirection of attention. When a majority of people look in one direction, everyone else does too (Sun *et al.*, 2017), especially if the faces that are already looking are trusted (Strachan and Tipper, 2017).

[†] Terror-driven swarms are sometimes called 'stampedes'.

the best bargains or to pass along a flask of coffee. But as soon as the doors were opened there was a rush to get inside that led, every year, to some tale of a fight that had broken out between hopeful shoppers fighting over a heavily discounted item. This kind of crowd comes together because of a shared purpose, not a shared feeling. I shall call it a 'mob'. Like crows mobbing a hawk, the members of a mob may act together, even selflessly, if the end result is to their personal advantage. This contrasts with the members of a swarm who selflessly give up their lives for others. The connection between individuals that makes them into a mob is not their interbrain connection but a commonality of purpose that they discover through their 'theory of mind'.

There is a third kind of crowd, which is probably the most common one. It is where people feel the pull of the swarm or the mob, but observe themselves doing so and so remain, to some degree, aloof. They may get caught up momentarily in the crowd experience, but they can also separate themselves.

I am not clear on whether it is the interbrain connection that shuts off individual rationalization or whether it is the intense emotion, or perhaps it is both.

Swarm-like behaviour can also operate over time, with secular rather than immediate effects. Paths across fields get established by successive path users, who might be sheep, people, or both, who follow in each other's footsteps often enough to kill the grass and make a groove in the underlying earth. These paths may lead to a distant stile that is not obvious when first entering the field, and the walker commits to the path knowing that it feels more comfortable to do so but also trusting that the path exists because it is the right path.*

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* Paths can be created in different ways. In one experiment, a slime mould, Physarum, was placed on a Petri dish and glucose was added regularly at points

Equality

The first person to break a path could be anyone, chosen by happenstance. There is no need for it to be an expert or an official. Path-breaking is an equal-opportunity activity.

Philosophers such as Henri Rousseau and legislators such as Thomas Jefferson, the author of the US Declaration of Independence, have taken it to be, in the words of the Declaration, a self-evident truth that all men (exceptions were made for women and slaves) are created equal. We take this sentiment so much for granted that we do not question why it should be self-evident.

Yet many people in private conversation will admit to beliefs that some people are inferior in some way and others superior. Not only is this taken to be a fact, but many reasons are given to justify this view and as many reasons are given for ensuring that society is organized around this fact.

I shall argue in this section that we take equality to be self-evident because that is how we experience ourselves in relation to other people in certain situations in groups – situations that favour our interbrain connection with other people.

But one might similarly argue that groups are the very situations in which the worst kinds of violent behaviour towards

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on the dish that corresponded to the cities making up Greater Tokyo and its surrounding cities. The mould at first sent feeding tubes in all directions (barring some that were strongly illuminated in order to mimic impassable geographic features like lakes and the sea), but then the tubes connecting the points where glucose was added increased in size, and those going elsewhere atrophied. The resulting pattern of the mould closely resembled the grid of the Tokyo subway system (Tero *et al.*, 2010).

The Tokyo grid was made by planners who could project forwards from the Tokyo terminus to the map references of the cities that the line was serving. The Physarum could not know its destination before it started, but reinforcement of the tubes that found glucose, coupled with atrophy of the ones that did not, had the same result. More regular tread on the path that correctly leads to the stile is another way of finding the right path.

out-groups occur. In their book on 'social dominance', Sidanius and Pratto give several egregious instances of this, including the Klu Klux Klan's racist persecution of people of colour and the Serbian army's treatment of Croatians during the civil war that broke up Yugoslavia.[18] Social dominance theory rests on the assumption that the most powerful will not only exercise that power to their advantage, but also support others doing so, whilst the weak will not just submit, but also actively collaborate. Social dominance theory is an ethological one, in that its main argument is that this is just how people are. The earliest records of human groups are about kings or gods, not ordinary people, suggesting that this may be how people have always been. And this does not just apply to people; it is also how chimpanzees and other primates behave. There is a dominant male, and often a dominant female, too, in any stable chimpanzee group.

The people who framed the constitution were speaking for a nascent nation of people who were, in many cases, strangers to each other. Their model was that of the spontaneously arising crowd that might spring up around some grievance – an example from the US is that of increased taxation by George III, king of Great Britain. The protest meetings and their actions were not organized at first but carried out by anonymous crowds. Organization of these crowds led to the formation of stable groups in which dominant individuals and in- and out-groups were identified.

Equality in spontaneous groups

Elias Canetti,[19] in his magisterial *Crowds and Power*, considers that crowds* have four main attributes: '1. The crowd always wants to grow... 2. Within the crowd there is equality...

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* I think that Canetti is writing about the kind of crowd that I am calling a 'swarm'.

3. The crowd loves density… 4. The crowd needs a direction.'
The wish for density, for contiguity, is something that strikes
Canetti particularly because it is the reverse of how most of
us normally feel, which is to hold ourselves away from other
bodies.* I would go further than Canetti and argue that it is
from our experience of being in a crowd or spontaneous group
that we learn equality.† There is some evidence for this.[20]

Other animal swarms and interbrain connections

There are, apparently, two super-colonies of Argentinian ants in
the Mediterranean, one extending over 6000 kilometres.[21] We
do not think of this as a swarm, indeed we may even be unaware
of its existence, because it does not move en masse. Similarly,
observers may be unaware of the build-up of the population of
Norwegian lemmings under the Arctic snow until they break
cover and move. Argentinian ant super-colonies are divided
into nests with their own queens, who communicate with the

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* See also Novelli *et al.* (2013).

† I already noted that it is the equality of its members that confers a potential
survival advantage on the crowd because each member can provide a different
perspective on the environment. This is also true of other primate crowds, and a
study by Strandburg-Peshkin *et al.* (2015) demonstrates this.

    Strandburg-Peshkin *et al.* fitted approximately a quarter (25 individuals)
of the members of a troop of wild-living olive baboons (Papio anubis) with
detectors and monitored the movements of the troop. The basic social unit of
this species of baboon is a harem: a single adult male with females and young
baboons. Older male children are excluded and live with other males who have
no female partner. The direction of the troop did not reflect this male dominance
pattern. A new direction could be initiated by any baboon. If two baboons
initiated a movement in two directions with an acute angle between them, the
troop would move in the direction that bisected that angle. If there was a wide
angle between two vectors of movement, some baboons would follow one and
some another until it was obvious which direction the majority was following,
when the whole troop would join up again and move in that direction.

nest chemically. But the queens also move from one colony to another, stitching together the connections that make the super-colony. Norwegian lemming females share child-rearing and are therefore alert to the welfare of neighbours' children, thus creating overlapping networks of social connections. Argentinian ants in their super-colony or Norwegian lemmings are, like locusts in their gregarious phase,[*] an immobile swarm or, in human terms, a cohesive group.

Are swarm-like crowds stupid?

Intellectuals have tended to look down on crowds, along with fashions and other fads. Even Freud, who promulgated the importance of the irrational (which he called the unconscious) in human behaviour, distrusted them.[†]

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[*] Locusts provide a particularly interesting animal parallel to the opposition of interbrain and wilful communication, as they exist in two forms, or phenotypes, one solitary and one gregarious. The solitary form is green and the gregarious one, brown. The gregarious form has more resistance to infection (these facts taken from Simpson and Sword 2008) but is less fertile. From a purely biological point of view, the existence of the gregarious phenotype is evidence for a Lamarckian model of inheritance in that its offspring are also gregarious, although their offspring often revert to the solitary phenotype. The mechanism involved in this remains unclear but is probably a kind of imprinting, attributable to epigenesis. Solitary forms take some time to change colour but can switch behaviourally to the gregarious behaviour within hours. The trigger is touch stimulation of a part of the body as a result of crowding. The switch is probably mediated (in both directions) by serotonin (Ernst *et al.*, 2015).

[†] His major work on this subject was *Group Psychology and the Analysis of the Ego* (Freud, 1922) in which he develops the notion of the 'primal horde' that he had introduced in 1912 (Freud, 1955/1912), a propos of a comment of Charles Darwin. This has some similarities to my concept of a swarm, but rather than making the swarm the responsible agent for choosing or abandoning its leader, Freud makes the leader, and the fear that he (always a male for Freud) induces in the horde, the binding force. The horde does have some properties that explain this. It, for example, has 'a thirst for a leader'. Freud also opposes the ideas of individuals that lead to individual action through an individual's will and the emotional tie that connects members of the primal horde, which saps their

Swarms have the advantage over individuals or mobs when it comes to negotiating new territory.[22] The swarm has multiple viewpoints, and so long as at least one person sees a suitable way forward and others follow them, it does not matter if the ones at the back cannot see anything. Similarly, if one bird or one fish sees a threat, it does not matter if other individuals do not see it, so long as the flock or the shoal follows that one individual.[*] An interbrain connection overriding each individual decision-maker means that the whole collective can move very quickly to evade. The reciprocity of the interbrain connection also helps. The movement of the adjacent animal does not have to be interpreted and then a decision made to copy their movement. Copying the movement and understanding it are one and the same. If one could peer into the brain of a fish, it may even be that as far as that brain is concerned, there is no difference between initiating a veer from danger or following another fish veering from danger: they may be the same movement.[†]

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individual will so that the horde can only act as an expression of the collective will. He wrote: 'What we have just described in our general characterisation of mankind must apply especially to the primal horde. The will of the individual was too weak; he did not venture upon action. No impulses whatever came into play except collective ones; there was only a common will, there were no single ones. An idea did not dare to turn itself into a volition unless it felt itself reinforced by a perception of its general diffusion. This weakness of the idea is to be explained by the strength of the emotional tie which is shared by all the members of the horde' (Freud, 1922, p.91).

*   What does matter, though, is how connected one's neighbours are (Rosenthal *et al.*, 2015).

†   The action of the interbrain to ensure coordination between organisms may be one reason that, in emergency evacuations, crowds exit in a more orderly way than groups of disconnected individuals each seeking their own safety without reck for anyone else (Cocking, Drury, and Reicher, 2009). Models of emergency evacuations suggest that fear enhances coordinated movement so long as no-one panics and becomes immobilized (Lin and Lucas, 2015).

Cohesion, crowding, and swarming

Obviously, there is no physical connection that holds people together once the umbilical cord is cut. There are people who choose to live alone, as hermits, and they survive, although they are also prone to what our forefathers, who were more familiar with this tendency, called 'accidie'. Despite this, William Trotter, an early sociologist, thought it self-evident that people liked to be together, attributing this tendency of people to live and work in groups to a 'gregarious instinct'. Instincts have gone out of fashion as an explanation for behaviour, to be replaced by cognitive explanations. There are many thoughtful reasons for people to join together, for example to complete a task that requires more than one person or to find a mate. But, as I have already noted, Trotter got it right in one sense: there is something involuntary that pulls an in-group together.

There have been some studies of factors that influence nonverbal connectivity – or interbrain bandwidth – using one index of the interbrain connection: contagious yawning.[*] There have been a few, but not many more, studies of cohesion, and these results may give some idea of the factors that increase or decrease interbrain bandwidth. Proximity increases cohesion if the proximal others are experienced as sufficiently similar, but it is aversive and increases the sense of being different to the proximal others if there is insufficient basis for commonality.[†]

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[*] A simple but effective measure of the bandwidth of the internet connection is 'contagious yawning' when one person yawning sets off yawning in other people. Women find yawning more contagious, apparently because of their higher empathy, and people find the yawning of family members or friends more contagious than strangers (Norscia, Demuru, and Palagi, 2016). This may be one explanation for the link between familiarization in a group and the development of cohesion.

[†] Described by Paulus (2015). In a book on the experience of concentration camp life, Sofsky (1997/1993) describes both of these outcomes as the result of being