The Dunbar Number, From the Guru of Social Networks

By Drake Bennett on January 10, 2013
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A little more than 10 years ago, the evolutionary psychologist Robin Dunbar began a study of the Christmas-card-sending habits of the English. This was in the days before online social networks made friends and "likes" as countable as miles on an odometer, and Dunbar wanted a proxy for meaningful social connection. He was curious to see not only how many people a person knew, but also how many people he or she cared about. The best way to find those connections, he decided, was to follow holiday cards. After all, sending them is an investment: You either have to know the address or get it; you have to buy the card or have it made from exactly the right collage of adorable family photos; you have to write something, buy a stamp, and put the envelope in the mail. These are not huge costs, but most people won't incur them for just anybody.

Working with the anthropologist Russell Hill, Dunbar pieced together the average English household's network of yuletide cheer. The researchers were able to report, for example, that about a quarter of cards went to relatives, nearly two-thirds to friends, and 8 percent to colleagues. The primary finding of the study, however, was a single number: the total population of the households each set of cards went out to. That number was 153.5, or roughly 150.

This was exactly the number that Dunbar expected. Over the past two decades, he and other like-minded researchers have discovered groupings of 150 nearly everywhere they looked. Anthropologists studying the world's remaining hunter-gatherer societies have found that clans tend to have 150 members. Throughout Western military history, the size of the company—the smallest autonomous military unit—has hovered around 150. The self-governing communes of the Hutterites, an Anabaptist sect similar to the Amish and the Mennonites, always split when they grow larger than 150. So do the offices of W.L. Gore & Associates, the materials firm famous for innovative products such as Gore-Tex and for its radically nonhierarchical management structure. When a branch exceeds 150 employees, the company breaks it in two and builds a new office.

For Dunbar, there's a simple explanation for this: In the same way that human beings can't breathe underwater or run the 100-meter dash in 2.5 seconds or see microwaves with the naked eye, most cannot maintain many more than 150 meaningful relationships. Cognitively, we're just not built for it. As with any human trait, there are outliers in either direction—shut-ins on the one hand, Bill Clinton on the other. But in general, once a group grows larger than 150, its members begin to lose their sense of connection. We live on an increasingly urban, crowded planet, but we have Stone Age social capabilities. "The figure of 150 seems to represent the maximum number of individuals with whom we can have a genuinely social relationship, the kind of relationship that goes with knowing who they are and how they relate to us," Dunbar has written. "Putting it another way, it's the number of people you would not feel embarrassed about joining uninvited for a drink if you happened to bump into them in a bar."

While Dunbar has long been an influential scholar, today he is enjoying newfound popularity with a particular crowd: the Silicon Valley programmers who build online social networks. At Facebook (FB) and at startups such as Asana and Path, Dunbar's ideas are regularly invoked in the attempt to replicate and enhance the social dynamics of the face-to-face world. Software engineers and designers are basing

their thinking on what has come to be called Dunbar's Number. Path, a mobile photo-sharing and messaging service founded in 2010, is built explicitly on the theory—it limits its users to 150 friends.

"What Dunbar's research represents is that no matter how the march of technology goes on, fundamentally we're all human, and being human has limits," says Dave Morin, one of Path's co-founders. To developers such as Morin, Dunbar's insistence that the human capacity for connection has boundaries is a challenge to the ethos of Facebook, where one can stockpile friends by the thousands. Dunbar's work has helped to crystallize a debate among social media architects over whether even the most cleverly designed technologies can expand the dimensions of a person's social world. As he puts it, "The question is, 'Does digital technology in general allow you to retain the old friends as well as the new ones and therefore increase the size of your social circle?' The answer seems to be a resounding no, at least for the moment."

At 65, Dunbar is thickening slightly, with a scholar's slouch, although he tends to take stairs two at a time. A professor at the University of Oxford, he lunches regularly in the senior common room of Magdalen College, where he's a fellow. The cozy space, with oil portraits of long-dead scholars in robes and wigs, looks out on a baize-like lawn. In November, over thin, gray lamb chops, he told a bit of his story. He grew up in Tanzania, where his father was an electrical engineer, and as a teenager he'd dive and sail off the coast and drive into the bush to shoot elephants. When he was at graduate school in the early 1970s, his original research interest was not human friendship but the social life of the gelada, a monkey found only in the Ethiopian highlands and closely related to the baboon.

Dunbar has a quick, ironic smile and speaks sleepily, in long, fluent dilations. What attracted him to the gelada, he says, were "the peculiarities of their social system, which is based around small family groups which come together into large herds. It's kind of vaguely similar to what you see in modern hunter-gatherers. It's called a fission-fusion social system, and it only occurs in two monkeys out of all the 300-odd primates—aside from humans."

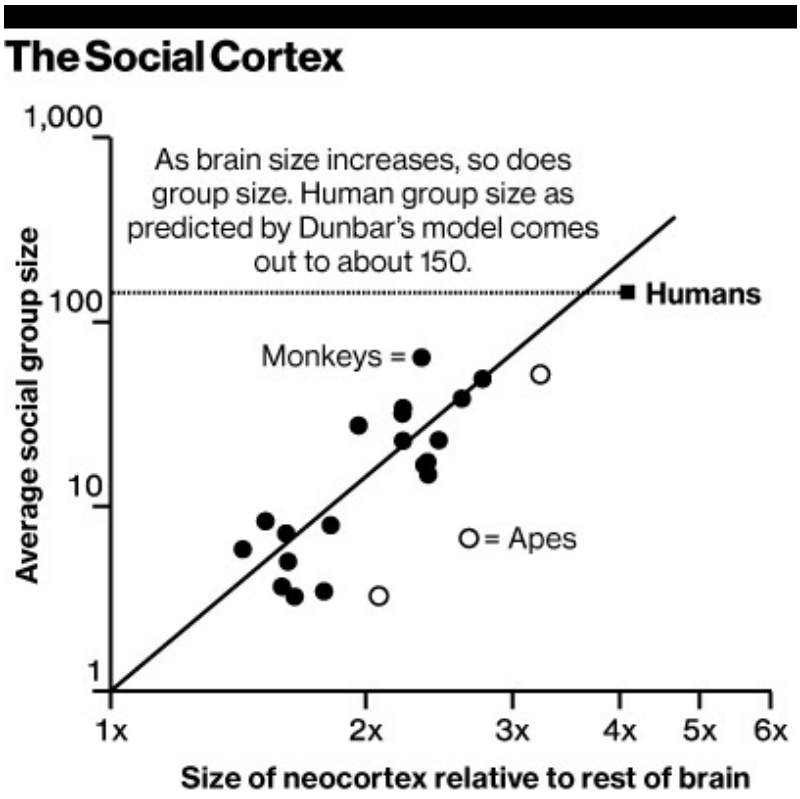
It was the monkeys' grooming habits that really interested him. For geladas, as for many other primates, grooming is only partly about cleanliness. It's also a form of bonding. Gelada life is rife with intrigue—there are cabals and coups and uneasy alliances—and the monkeys cement friendships by picking through each other's fur for parasites and kneading the skin beneath. In an early paper, Dunbar showed that the amount of time geladas spend grooming is not a function of body size, which would suggest a solely hygienic purpose, as bigger bodies take longer to pick over. Instead, it's a function of group size. The bigger the troop, the more time its members spend trying to curry favor with each other through massage. Dunbar began to wonder what other characteristics might correlate with group size.

In 1992, Dunbar published his answer: brain size. Scientists have long been intrigued by the question of why primates have such big brains. It's nice to be smart, of course, but big brains demand an enormous amount of energy and require years to grow to full size, and the larger skulls that protect them make childbirth much more dangerous. Plenty of species have thrived on this planet without much of a brain at all.

Dunbar's argument, laid out in the *Journal of Human Evolution*, was that big brains evolved to solve the problem of social life. Living in large groups confers significant advantages, chief among them better protection against predators. But living together is also difficult. Members compete for food and access

to mates. They have to guard against bullies and cheats—and pick their own spots to bully or cheat. “For very social species, and this applies particularly to primates, the group is an adaptation to solve particular ecological problems,” Dunbar explains. “But the group itself triggers a whole series of problems at the individual level. It’s essentially the social contract problem: People tread on your toes; they steal your food just as you’ve unearthed it.”

As group size grows, a dizzying amount of data must be processed. A group of five has a total of 10 bilateral relationships between its members; a group of 20 has 190; a group of 50 has 1,225. Such a social life requires a big neocortex, the layers of neurons on the surface of the brain, where conscious thought takes place. In his 1992 paper, Dunbar plotted the size of the neocortex of each type of primate against the size of the group it lived in: The bigger the neocortex, the larger the group a primate could handle. At the same time, even the smartest primate—us—doesn’t have the processing power to live in an infinitely large group. To come up with a predicted human group size, Dunbar plugged our neocortex ratio into his graph and got 147.8.



DATA: THE SOCIAL BRAIN HYPOTHESIS, DUNBAR 1998

Dunbar was not the first to suggest that social dynamics explained the evolution of higher intelligence, but the simple arithmetic of his argument—bigger brains equal bigger groups—gave it resonance, and he’s now seen as the father of what’s known as the social brain hypothesis. “It’s been very influential,” says Simon Reader, an evolutionary biologist at McGill University. “It has been the dominant hypothesis.”

The Dunbar Number has made its namesake an intellectual celebrity. Much of his recent writing has been for popular audiences. For a while he contributed regularly to the *New Scientist* magazine and the *Scotsman* newspaper. He has spoken at TED and written books for lay readers; the most recent of them, *The Science of Love*, was published in the U.S. in November. Although he’s an engaging writer, his more

recent books give the impression of having been written quickly. In The Science of Love there's an amusing page-long description of the erotic effects of the steroid androstadienone. That description also appears, almost word for word, in his previous book. Asked about this, he says, "You tend to slip into these sorts of standard formulations, I think. I don't think there's anything that's directly cut and pasted."

In person Dunbar retains a certain remove, not exactly aloof and not exactly shy. Sitting and speaking in his cinder-block-walled office at Oxford's department of experimental psychology, he twists metronomically in his swivel chair, leaning back and running his eyes over the spines of the books on his bookshelves. He gives the impression of someone not actively looking to increase his number of bilateral relationships. Asked whether as a scholar of social behavior he thinks of himself as a particularly social person, he says, "I guess I'm sort of about average. I'm certainly not hypersocial, that's for sure." Over the course of one afternoon, he is interrupted twice by phone calls. The first is a major book festival asking him to be a guest speaker. The second is BBC News asking him to come on that evening. He says no to both, the first one with a trace of annoyance—he'd already declined by e-mail, he explains later.

His professional network spans an array of disciplines. He's collaborating on projects with linguists, computer scientists, physicists, classicists, economists, archeologists, anthropologists, and literary scholars. All the projects are related to the social brain hypothesis. One study looks at laughter, its physiological effects, and the role it might play in cementing social bonds. Another considers, in a similar way, dancing. His collaborators universally praise him. "For me, Robin is the sort of person you can't help liking within about five minutes of meeting him," says Felix Reed-Tsochas, a theoretical physicist at Oxford who's collaborated with him. "He's full of really, really interesting ideas and insights, which just kind of gives you a buzz."

In the fall of 2010, Dunbar got a phone call from Morin, who had been the executive in charge of Facebook's app platform and co-invented Facebook's Connect feature. Earlier that year he'd left the company to help found Path. He had discovered Dunbar's work years earlier as a freshman economics major at the University of Colorado.

Morin, now 32, grew up in Helena, Mont., a town of 28,000 people, and he talks about small-town life in the key of John Mellencamp. "America was built on the backs of these small communities," he says, sitting in a conference room at Path's offices in a downtown San Francisco skyscraper with a view of the Bay. Although Morin has spent his adult life in cities, he's used online networks to create communities with the closeness of his hometown.

Path, he says, provides a way for anybody to be able to do that. The service allows people to post photos from their smartphones. Users can message each other and comment on and search through the material others have posted. One of its more intimate features allows someone to tell everyone in his network when he's going to sleep and when he's woken up. But that network cannot be larger than 150 people. Path, in essence, is for clans.

"People feel like they can put things on Path they can't put anywhere else," Morin says. "Fundamentally, once you go beyond this number of people you can keep in your head, you begin to filter yourself, you change what you share and how much, you put on your public face." The service recently passed 5 million users, and Morin says keeping its network size small has rewarded the company with a

remarkably engaged user base.

Morin and Dunbar's first conversation lasted a couple of hours. Among other things, they talked about Dunbar's research on how long the average friendship can survive in the absence of face-to-face contact (6 to 12 months), and about how, according to Dunbar, a woman can have two best friends (including her romantic partner), but a man only one. Since then the two have spoken every few months. The search algorithm Path uses to find a user's closest friends is based on Dunbar's work. Morin says the service is launching several features this year that grow out of the psychologist's ideas, although he declines to describe them.

Morin likes to point out that it's misleading to talk about a single Dunbar Number. Dunbar actually describes a scale of numbers, delimiting ever-widening circles of connection. The innermost is a group of three to five, our very closest friends. Then there is a circle of 12 to 15, those whose death would be devastating to us. (This is also, Dunbar points out, the size of a jury.) Then comes 50, "the typical overnight camp size among traditional hunter-gatherers like the Australian Aboriginals or the San Bushmen of southern Africa," Dunbar writes in his book *How Many Friends Does One Person Need?* Beyond 150 there are further rings: Fifteen hundred, for example, is the average tribe size in hunter-gatherer societies, the number of people who speak the same language or dialect. These numbers, which Dunbar has teased out of surveys and ethnographies, grow by a factor of roughly three. Why, he isn't sure.

The venture capitalist Jerry Murdock is one of Path's investors; his firm, Insight Venture Partners, also invested in Twitter and Tumblr. Murdock, who has a numerological streak, sees Dunbar's Number as a sort of social Fibonacci sequence, a simple mathematical relationship revealing a deeper truth about the workings of the universe. He believes the two sets of numbers may be related. "What Dunbar's theory does, like all good theories, is it explains constraints, constraints in nature," he says. "And it's the constraints that make great architecture. It's the constraints that make great companies."

Just as simplicity has popularized Dunbar's ideas, it has opened him up to the charge of reductionism. "We want to apply this single monolithic idea that reduces all the complexity of the world to just one dimension and just one number," says Duncan Watts, a network theorist and research scientist at Microsoft (MSFT). As he sees it, Dunbar's model of friendship, as a series of circles of intimacy, is a massive oversimplification: In real life, people don't have better friends and worse friends, they have different sorts of friends they go to for different things. "If you're saying there's only 150 people who matter, my response is, 'Matter to what?' " he says. "Depending on what you're trying to do, the people who matter may be your co-workers, they may be your old high school friends, they may be your current social circle, they may be your family. The challenge for social networking sites is to solve that problem."

Others, anthropologists and brain scientists in particular, challenge the evolutionary story Dunbar tells, arguing that it discounts other factors that might have driven the development of the big human brain—the pressure to figure out more efficient ways to forage, or the need to surmount the defense mechanisms of the plants and animals our ancestors wanted to eat. "Ecological pressures like avoiding predators, finding food and shelter, choosing habitats—all these kinds of decisions. I think they played a role" in brain growth, says Reader, the biologist.

Researchers who've used different methods to measure the size of a person's social circle have come up

with numbers that don't match Dunbar's. One set of studies by the anthropologist Russell Bernard and the network scientist Peter Killworth found a mean social network size of 291. Another paper, published this month in the *Journal of the American Statistical Association*, came up with 611.

Among social network architects, there are those who see the Dunbar Number less as a wall and more as a hurdle. When Morin was at Facebook, he used to discuss behavioral science with Dustin Moskovitz, one of its co-founders. In 2008, Moskovitz, along with the programmer Justin Rosenstein, left Facebook to found Asana, a company that offers task-management software meant to improve how work teams collaborate. Whereas Path fits itself to the contours of the social limits Dunbar describes, Asana seeks to explode them.

To Moskovitz and Rosenstein, a tool such as Asana—or Facebook, for that matter—is like a telescope. It's a technology that extends the range of our abilities. "It gives us more capacity for keeping track of these relationships, for annotating them, knowing what people are doing, developing an understanding of their strengths and weaknesses, without necessarily having a bunch of one-on-one conversations," says Moskovitz. Rosenstein adds: "Certainly that's one of our semisecret sub-missions: to increase Dunbar's Number."

At Facebook itself, Dunbar still comes up often. "We do talk about it. In a lot of contexts it's a compelling framing of some of the data that we have about people's relationships," says Cameron Marlow, a sociologist and the head of the company's data science team.

Dunbar is familiar with the critiques of his work, and he has responses to them. He agrees with Watts, for example, that people have different social networks for different purposes, but that doesn't mean there isn't some basic emotional bond we reserve for some people, independent of their utility to us: "Someone like your boss, or the person you borrow $50 from to pay the drug dealer, these people are meaningful in your life, but they're not meaningful to you as relationships." He also continues to find his number popping up all around him. A paper published in 2011 found that on Twitter the average number of other people a user regularly interacts with falls between 100 and 200. And though the limit on how many Facebook friends one can have is a generous 5,000, the average user has 190—more than 150, but within what Dunbar sees as the margin of error.

Dunbar himself has zero Facebook friends. He occasionally peers over his wife's shoulder when she logs on at home, but he isn't on the social network. He has a LinkedIn (LNKD) account, he says, "by mistake." He opened a Path account but never uses it.

Dunbar does not rule out the possibility that human beings might be able to reset the cognitive limits on our social lives—we've done it before. The reason we're able to function in so much larger groupings than our primate cousins, Dunbar argues, is because, tens of thousands of years ago, we taught ourselves to talk. Whereas baboons bond by taking turns picking each others' nits, we have rhetoric and gossip and half-time speeches, not to mention singing and storytelling and jokes, to bring and hold us together. Language, he says, is how humans used their big brains to get to 150. And until something as revolutionary as that comes along, 150 is where he thinks we'll stay.