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The people's panopticon

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ABOUT halfway through Dave Eggers's bestselling dystopian satire on Silicon Valley, "The Circle", the reader meets Stewart, a bald, silent, stooped 60-year-old who has "been filming, recording, every moment of his life now for five years". Stewart is the first of the novel's characters to make all his actions visible to anyone with a computer who cares to look—the first "transparent man".

Cathal Gurrin, a computer scientist at Dublin City University, is not quite that transparent. But to those with access to his archive he is pretty see-through. Mr Gurrin is a "life logger", someone who thinks that if, as Socrates claimed, the unexamined life is not worth living, the life which is digitally recorded with an eye to potentially endless re-examination will have much to recommend it. Patterns in their data, they hope, will reveal opportunities to be healthier, happier and more effective.

To this end Mr Gurrin wears a wide-angle camera around his neck which snaps several pictures of his field of view every minute, recording its location and orientation each time it does so. He has been using such devices for more than seven years. Over that time he has built up an archive of 12m images, and he currently produces about a terabyte of data a year. That is more computer memory than was available on the whole planet 50 years ago. Today it can be bought, or leased in the cloud, for well under \$100.

Mr Gurrin and his students have used image-scanning software to break that archive into 70,000 searchable "events": meals, journeys, coffee-breaks, conversations and so on (on his current camera a lens cover provides seclusion in the toilet). Every day the algorithms recognise and index another 30. "If I need to remember where I left my keys, or where I parked my car, or what wine I drank at an event two years ago," he says, "the answers should all be there." But not all the answers are easily found. Searching by date and time is easy. Searching by type of wine, or looking for the identity of someone encountered by chance, is not. "What we

need", he says, "is a new generation of search engine."

(To watch a video interview with Cathal Gurrin, [click here](#).)

The Google Glass half-full

Hence the interest, among life loggers, in Google Glass, a thin headband which allows the wearer to take pictures and to see data on a tiny screen held just above, and to one side of, the right eye. (Disclosure: Eric Schmidt, Google's executive chairman, this week became one of *The Economist's* non-executive directors; like the rest of our directors he has no influence over our stories.) It is not the first wearable camera; but Google is hoping to make it the first that lots of people want to wear. Unlike Mr Gurrin's hardware, Glass is not designed to record whole days, let alone whole lives; Thad Starner of the Georgia Institute of Technology, who is an adviser to Google on the project, says that "Glass is a horrible life-logging platform." But if Glass is a hit it will be another step on the way to a world where those who wish to can record, rewind and rewatch more of what they see more easily—and where everyone else can end up recorded as part of the process.

Thanks to digital technology the world is replete with cheap and highly capable cameras. ABI, a research firm, reckons there were a billion built into the mobile phones and tablets shipped in 2012 (many boast more than one). Adding a run-of-the-mill digital camera to a phone, or pretty much anything else, costs about \$10. Narrative, a Swedish company that has raised \$500,000 through Kickstarter, is marketing a clip-on life-logger the size of a coin.



Steve Ward of VIEVU, a Seattle firm that has been selling wearable cameras to police forces for several years, and now has customers in 16 countries, says the devices can help protect any professional who takes on legal liabilities: repairmen, estate agents, doctors,

couriers and more. After all, many firms already record phone calls for similar reasons. The availability of a tamper-proof record often sorts out disputes before they escalate, expensively, into lawsuits. A year-long experiment with the widespread use of another model of wearable camera by police officers in Rialto, California, saw a spectacular fall in the number of complaints against the police by the public. It also saw less use of force by officers.

Putting together evidence can provide a compelling reason for civilians to record their lives, too. More than a million cars in Russia now sport dashboard-cams that record the road ahead. This is mainly so that drivers can defend themselves against fraudulent insurance claims.

It may be in medicine and the care of the elderly, though, that wearable cameras will spread quickest. For years some doctors have suggested that some patients with impaired memories should wear such devices. Research shows that patients encouraged to regularly review their lives by looking at a photostream stand a better chance of remembering important events or conversations. There is hope that such approaches could alleviate some symptoms of dementia and Alzheimer's disease and make coping with them easier, both for the afflicted and their carers.

I am a camera

Google aims to take wearable cameras out of their current niches and make them part of the culture. It plans to start selling Glass to the masses in 2014. When, last February, the company put out a call for beta testers with neat ideas, thousands of would-be "explorers" responded. In a "base camp" in San Francisco, some of those whose pitches were successful come to pick up the devices.

Tatiana Fitzpatrick, a jewellery designer from Arizona, wants to use Glass to record masterclasses in beading. Many of the other explorers, too, see hands-free photography as the thing that they want most; some talk of recording surgical operations, others want to capture the moment at which they propose to their partner. But there is much more to Glass than recording. A Google "guide" shows Ms Fitzpatrick how, with voice commands, head movements and taps on a control panel mounted on the device's arm, Glass can be used to access a range of data services (on November 12th the company said it would soon add music streaming). The plan is to perch all the functions of a smartphone on the bridge of the user's nose.

This, the company thinks, will be great for those who cannot get the most out of normal phones; some of its explorers have quadriplegia. And all will benefit from a new immediacy. By integrating data you want into the visual field in front of you Glass is meant to break down the distinction between looking at the screen and looking at the world. When switched on, its microphones will hear what you hear, allowing Glass to, say, display on its screen the name of any song playing nearby.

David Gelernter, a Yale computer guru, imagines apps that provide historical information to sightseers in foreign cities, or that help people identify plants and birds in their gardens. Telling people what they are seeing can make them more observant, more absorbed: "You will see finches and chickadees in detail where previously you saw only generic blurs of feathers."

For all that he sees the technology's possibilities, Mr Gelernter has a deep dislike for the way it would interpose itself between the user and his world, including the other people in it. "Developing and refining my own first reactions to my world is too important for me and my children to allow smart glasses to mix in and muddy the waters." He fears that people surreptitiously using Glass as a teleprompter, perhaps to seem more knowledgeable, could put at "risk the very frankness and honesty of human communications".

Less high-flown criticisms include complaints that the technology is clunky and overhyped. "A Segway for the face," say some, recalling the ludicrous levels of pre-launch buzz that made the Segway, a neat sort of scooter, such a disappointment when it was finally revealed. Developed within Google's secretive "X division", which works on far-out ideas, Glass might be one of those things which catches the company's fancy for a bit but later gets dropped.

Yet there are good reasons to think that Google will dig deep to make Glass a success. One of the company's founders, Sergey Brin, is deeply involved in the project, giving it a powerful champion. And Google, envious of the revenues that Apple, Samsung and others earn from their sleek machines, is keen on selling popular hardware as well as clever software. Glass offers the chance of defining an entirely new category of consumer product.

It could also contribute a lot to the company's core business. Head-mounted screens would let people spend time online that would previously have been offline. They also fit with the company's interest in developing "anticipatory search" technology—ways of delivering helpful information before users think to look for it. Glass

will allow such services to work without the customer even having to reach for a phone, slipping them ever more seamlessly into the wearer's life. A service called Google Now already scans a user's online calendar, e-mail and browsing history as a way of providing information he has not yet thought to look for. How much more it could do if it saw through his eyes or knew whom he was talking to.

This could easily edge over into areas consumers would find creepy. Take, for example, an idea on which Google applied for a patent in 2011: a camera that would keep track of which adverts and billboards its wearer noticed, and of any emotional responses they evoked. Glass cannot analyse its wearers' world, or its wearers, anything like this well yet, and many companies patent ideas without planning to make use of them. But it is hardly paranoid to think that a company which says its mission is "to organise the world's information and make it universally accessible and useful" might be interested in looking over its users' shoulders, if it can find a way to do so that they will think helpful and not find intrusive. If it could do so usefully and acceptably enough, Google could help users interrogate their own histories in much the same way as they now search for weather forecasts and celebrity news.

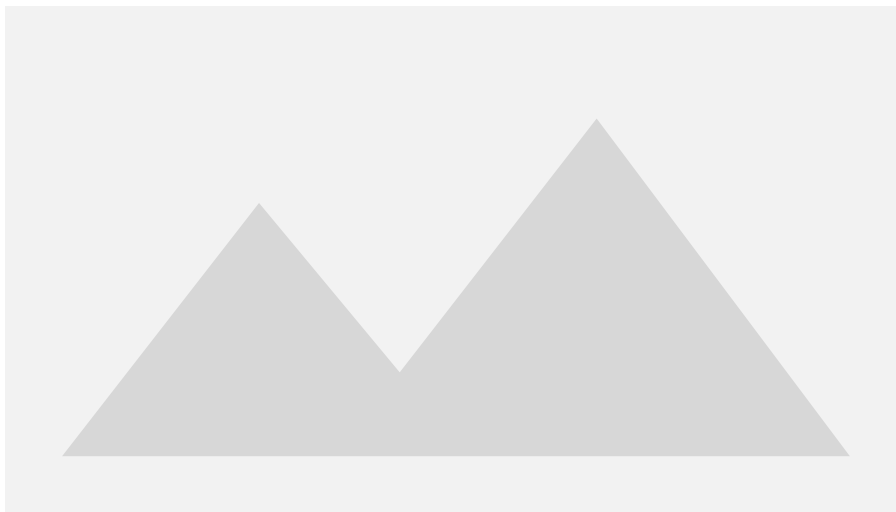
Me no Leica

People may in time want to live on camera in ways like this, if they see advantages in doing so. But what of living on the cameras of others? "Creep shots"—furtive pictures of breasts and bottoms taken in public places—are a sleazy fact of modern life. The camera phone has joined the Chinese burn in the armamentarium of the school bully, and does far more lasting damage. As cameras connect more commonly, sometimes autonomously, to the internet, hackers have learned how to take control of them remotely, with an eye to mischief, voyeurism or blackmail.

More wearable cameras probably mean more possibilities for such abuse. Face-recognition technology, which allows software to match portraits to people, could take things further. The technology is improving, and is already used as an unobtrusive, fairly accurate way of knowing who people are. Some schools, for example, use it to monitor attendance. It is also being built into photo-sharing sites: Facebook uses it to suggest the names with which a photo you upload might be tagged. Governments check whether faces are turning up on more than one driver's licence per jurisdiction; police forces identify people seen near a crime scene. Documents

released to the Electronic Frontier Foundation, a campaign group, show that in August 2012 the Federal Bureau of Investigation's "Next Generation Identification" database contained almost 13m searchable images of about 7m subjects.

Face recognition is a technology, like that of drones, which could be a boon to all sorts of surveillance around the world, and may make mask-free demonstrations in repressive states a thing of the past. The potential for abuse by people other than governments is clear, too. If the creep taking a creep shot, or looking at someone else's creep shot found online, can find out who he is ogling, the practice becomes yet more disturbing. Well aware of such concerns, Google has banned the use of face recognition in the apps that it makes available for Glass (dubbed Glassware).



But face recognition has its attractions, too. Bar staff and bouncers could be warned of trouble on the way (a British company already provides such a service); the ability to greet everyone cheerily by name might be welcomed in many service industries. There are rampant possibilities for phoniness, and for the loss of frankness Mr Gelernter fears. But not all pretence is culpable. How bad is it to check Facebook in a head-mounted display so as not to offend an acquaintance by momentarily being unable to place him? What of someone with deepening dementia who just wants to be able to interact as he used to?

If demand for face recognition grows, Google's stand against it might change. And Google is not the only player. Both Microsoft (where the first of Mr Gurrin's life-logging cameras was developed as a research tool) and Sony are thought to be looking into Glass-like devices. Mr Ward at VIEVU says that most companies currently providing wearable cameras for professionals are looking at face recognition, "whether from a business perspective, or a public-

safety perspective.”

And then there are hobbyists and hackers. An unapproved software hack already allows Glass-users to take photos simply by winking. The sanctioned way, designed so as to notify observers of what is going on, is to use a voice command or to touch the top of the device in a gesture that mimics that of clicking the shutter on an old-fashioned camera.

Not just recorded for training purposes

Even if private citizens do not make much use of face recognition to search their archives, it seems a fair bet that governments will—perhaps only in special circumstances, perhaps not. In America, warrants to seize user data from Facebook often also request any stored photos in which the suspect has been tagged by friends (though the firm does not always comply). Warrants as broad as some of those from which the National Security Agency and others have benefited in the past could allow access to all stored photos taken in a particular place and time.

Different countries will react to this in different ways. In America businesses and citizens enjoy broad freedom to collect photos and footage in streets and parks, as well as shops and restaurants. There are no bars to extracting information about those depicted.

Several European countries, by contrast, require the subject of a photograph to give permission before it is “displayed”. This once restrained newspapers and galleries, but now applies to much online use, too. Drivers are forbidden from using dashboard cameras in Austria; those who install them can face a €10,000 (\$13,400) fine. Last year objections from privacy advocates encouraged Facebook to disable facial recognition for users across Europe, and delete the data it had already collected. In South Korea and Japan industry accepts it as a norm that anything with which people can take a picture should notify others in the vicinity by making a shutter-click noise that cannot be turned off.

Public opinion may encourage American jurisdictions to tighten up. Lawmakers in some states have already clarified that no matter how public the setting, some sneaky photos (up skirts, say, or down blouses) are intolerable. In May a concerned letter from members of Congress appeared to accelerate Google’s decision to ban face recognition from Glass. In a case involving tracking a vehicle by sticking a satellite positioning system on it, the Supreme Court acknowledged that new forms of police surveillance may require

stronger legal safeguards, even if all the information is collected in public places. The Federal Aviation Authority has recently made clear, for the first time, that the privacy implications of what cameras on drones can see will be something it considers as it puts together a legal framework for their use.

At the same time, pressure from companies and from users who want new services may erode some of the privacy protections in Europe. Paolo Balboni of the European Privacy Association, a think-tank supported by large technology firms, argues that if some European countries choose to regulate Glass as if it were primarily a professional tool, not a personal one European users could lose out.

The personal-use point is crucial. Most legislation and regulation, at the moment, protects people's privacy from companies and governments, to the extent that it protects them at all. What about a world in which, simply by living their lives, people create vast searchable records of all they have seen—a world, not of Big Brother, but of a billion Little Brothers? Most governments and most citizens have barely given the question a thought. When should people be able to have their images removed from another person's non-commercial record? Does it matter if your life-log records the sexy stranger on whom your eye happens to fall without you explicitly asking it to do so? When should a wink be accompanied by the click of a camera shutter?

The fact that technology makes these things possible does not mean that law and regulation can put no check on them. But checks are unlikely to come about unless demanded. If people have accepted, as Mark Zuckerberg, the founder of Facebook, has claimed, that privacy is no longer a "social norm", few will make such demands—fewer still if ever richer digital memories offer real benefits. Mr Gurrin says that the life he has been logging has been improved by the process. He intends to keep the cameras on until he dies.

By the end of Mr Eggers's book, millions have followed Stewart into transparency. In a nice irony, the fate of those who do not want to is not explicitly recorded.

(Please click through to see more from our video series about wearable cameras, featuring interviews with [Saadi Lahlou](#), who uses wearable cameras to study human behaviour, and [Stephen Balaban](#), creator of the Lambda Hat, a wearable camera and computer.)

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