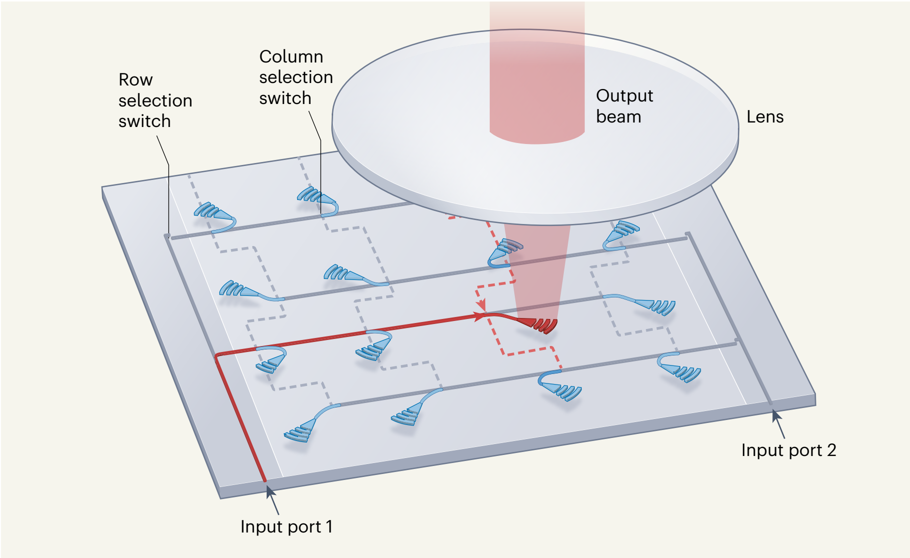

Figure 1 | An integrated lidar system. Zhang *et al.*[2] designed a light detection and ranging (lidar) system that can measure distances with high resolution and has a wide field of view, while maintaining a small footprint and low power consumption. The system comprises a 128 × 128 array of optical antennas (a representative 4 × 4 array is shown here) into which light (red arrows) is routed from one of two input ports along selected rows and columns by means of micro-electromechanical switches. Antennas in the same column are connected electrically (dashed lines), reducing the number of switches required. The lens (not to scale) converts the light emitted by the antenna into a laser beam that can point in 16,384 distinct directions, enabling distance measurements across a field of view of 70°. (Adapted from Fig. 1 of ref. 2.)

because it enables a microsecond response time. The chip also benefits from an innovative system of waveguides, which limits the number of switches required. Each column of the array is connected electrically through one of these waveguides, so a given antenna can be turned on by selecting the appropriate row and column switches, without the need for a separate switch at each antenna (Fig. 1). Light is routed to the chosen antenna from one of two input ports and then emitted at an angle that is uniquely prescribed to that antenna. When the switches are turned off, there is almost zero loss; this limits power consumption, even in large-scale arrays.

The performance of Zhang and colleagues' lidar system is very promising, especially with so many pixels and such a wide field of view. High-resolution 3D images can easily be captured by combining the device with a light source that transmits continuous power at a frequency that can be modulated. The device can detect distances with a resolution of 1.7 centimetres, which matches well with the frequency range of the laser that the authors used. This indicates the feasibility of the lidar system for practical applications. And by selecting lenses with different focal lengths, the field of view and lateral resolution (a measure of the ability to distinguish between two adjacent points in the field of view) could potentially be adapted to different scenes, demonstrating the flexibility of the approach.

However, the measured lateral resolution is only 0.13°, which is relatively low. This will restrict its applicability for long-distance detection, a shortcoming of many systems that incorporate a focal-plane switch array. The resolution could be improved by increasing the chip size or shrinking the footprint of each pixel, which would require further optimization of the switch design.

Nevertheless, Zhang and co-workers' device could provide a breakthrough in integrated lidar systems. As processing technologies mature, further miniaturization and improvements in performance will make focal-plane switch arrays a promising technology for applications including megapixel 3D lidar and optical communications.

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Psychology

A feeling of familiarity can deter crime

Elicia John & Shawn D. Bushway

A combination of Internet-based and field experiments suggests that being given personal information about a stranger leads people to believe that they themselves are known to that person — and to change their behaviour accordingly. **See p.297**

Community policing is often held up as an instrumental part of reforms to make policing less harmful, particularly in low-income communities that have high rates of violence. But building collaborative relationships between communities and police is hard. On page 297, Shah and LaForest[1] describe a large field experiment revealing that giving residents cards and letters with basic information about local police officers can prevent crime. Combining these results with those from Internet-based experiments, the authors attribute the observed reduction in crime to perceived 'information symmetry'.

Known strangers are individuals whom we've never met but still know something about, such as celebrities. We tend to assume, erroneously, that known strangers know as much about us as we do about them. This tendency to see information symmetry when there is none is referred to as a social heuristic — a shortcut in our mental processing.

Shah and LaForest used a series of Internet-based conceptual experiments to evaluate how this heuristic manifests in judgements about known strangers. The authors

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Figure 1 | Community police in New York City. Shah and LaForest[1] provide evidence that giving residents personal information about their community police officers can reduce crime.

conducted the experiments on a US crowdsourcing platform called Amazon Mechanical Turk. Research participants on this platform are not representative of the US adult population, tending to skew towards white, liberal and younger people relative to the population in general[2]. Nonetheless, research indicates[3] that there are considerable similarities between treatment effects in experiments run on convenience samples (for example, students or online opt-in sampling) and on representative population-based samples.

In each experiment, participants thought they were exchanging basic information with another person (a known stranger), although, in fact, no such person existed – instead, participants received pre-programmed answers to set questions.

Each experiment tested, in a different way, how much the information received by the participant affected their perception of how much the known stranger knew about them. The final two experiments then showed that this perceived information symmetry lessened the likelihood that a participant would be dishonest when they thought the known stranger would be responsible for catching them cheating.

Next, Shah and LaForest applied these findings to a real-world setting – community policing (Fig. 1). Collaborating with the New York Police Department, the authors sent letters and cards to residents of 39 public-housing developments, providing information about the developments' local community police officers, called neighbourhood coordination officers. These flyers included personal details, such as the officers' favourite food, sports team or superhero. Thirty control developments had neighbourhood coordination officers, but did not receive flyers.

This field experiment provided convincing evidence that a simple intervention can reduce crime. Indeed, in the three months after the intervention, the researchers observed a 5–7% drop in crime in the developments that received the information compared with neighbourhoods that did not. This level of reduction is similar to that of more-aggressive policing policies[4]. The drop in crime lessened after three months, which the authors suggest is due to the light touch and limited duration of the intervention. Interventions designed to keep officers' information at the top of residents' minds (such as flyers sent over a longer period at a greater frequency) might therefore result in longer-term effects.

"This field experiment provided convincing evidence that a simple intervention can reduce crime."

The authors attribute the reduction in crime to a heightened perception among residents receiving flyers that the officer would find out if they committed a crime. The possibilities of such findings are potentially exciting, because the work implies that a police officer who is perceived as a real person can prevent crime without tactics such as the New York City police department's 'stop, question and frisk' policy, which tended to create animosity between community members and the police.

The mixed-method approach of Shah and LaForest – using Internet-based experiments to evaluate psychological mechanisms and then testing those mechanisms in a real-world context – is a strength of the study. But the results of the Internet-based experiments were not fully mirrored in the field experiment. Specifically, residents who received flyers were more likely than those who did not to say they thought officers would find out if they committed a crime, but not that officers knew more about them in general. This latter element is a key facet of the information-symmetry phenomenon tested in the Internet-based experiments, and suggests that other factors might also be contributing to some of the results observed in the field experiment.

The authors rule out several of these possible alternative factors. For instance, they show that the intervention did not affect how people viewed their local officers' familiarity with the area. It also had no effect on residents' trust in the police or perceived levels of police presence. However, other psychological phenomena could still be at play.

These include similarity judgements (the fact that knowing more about a stranger can make them feel more similar to you) and psychological closeness (the fact that feelings of similarity can increase emotional connectedness, leading to transformative behaviour)[5–7]. Indeed, these phenomena have previously been used to develop interventions aimed at reducing delinquency[8]. In Shah and LaForest's field experiment, feeling more psychologically close to a known stranger (the police officer) might serve as a deterrent from engaging in negative behaviour that would damage one's relationship with the stranger. In that case, the change in behaviour would be driven by a greater emotional connection, not by perceived information symmetry. Finally, the intervention could plausibly lead residents to think that police surveillance of their community is greater than it actually is – something not evaluated in this study.

Indirect social control – ideally, that created by the community itself – is less costly and intrusive than surveillance or direct control by outside agents[9]. The current study cannot show us how to deter crime without relying on surveillance by outsiders. But until such policies are developed, Shah and LaForest's work might highlight one valuable way in which police forces could get more bang for their buck when deploying officers in a community.

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Machine learning

Mind the gap as AI guesses at lost Greek inscriptions

Charlotte Roueché

The use of artificial intelligence (AI) is transforming many areas of research. A new AI tool helps to fill in missing text and estimate the timeframe and geographical origin of ancient inscriptions. **See p.280**

The possibility that artificial intelligence (AI) will automate tasks and thus destroy certain jobs is advancing steadily into more and more areas of life; the waves are now lapping even on the quiet shores of ancient-world studies. On page 280, Assael *et al.*[1] present an AI tool called Ithaca, which has been developed to bring deep learning to the world of classical studies and the interpretation of transcribed ancient Greek texts, which were originally inscribed on stone. But this advance should not be interpreted as a threat to centuries of tradition – rather as a complement to them.

The study of the past is always based on insufficient evidence, and the more distant the past, the more fragmentary the evidence. Historians regularly use hypothesis to bridge the gaps, and regularly modify their hypotheses. In the case of the study of inscribed texts (epigraphy), this is literally true. Epigraphers have to develop skills, based on painstaking study and wide experience, to fill the gaps in texts that survive only in fragments, and to assess the material's date and provenance. Until now, this work has usually relied on the deep experience of a community of scholars, who gradually learn to identify the linguistic conventions of particular societies and their customary procedures (such as ratifying a decree). Ithaca offers a computer-based way to approach these tasks (Fig. 1), and uses deep learning to replicate and improve the results. Such a method can provoke real fears that human understanding might become superfluous – fears not so different from the concerns felt in other fields of expertise.

In the area of humanities, scholars of the classical world have been surprisingly advanced in their adoption of digital tools with which to present and exploit their materials. Several early resources, such as the rich collection of literary texts in the Perseus Digital Library of ancient Greek and Latin texts (see go.nature.com/3t5yvub), were conceived in the 1980s, made available in compact-disc format in the 1990s, and then transferred to the Internet during the 2000s. The early birth of such projects meant that many were designed and understood principally as tools for searching. Since then, the Internet has been used to present data that would otherwise be prohibitively expensive to publish – such as the ground-breaking online publication of the Vindolanda Tablets (see go.nature.com/3jz5c1d), a set of correspondence between Roman soldiers and their families who were based around Hadrian's Wall in Britain in the late first and early second centuries AD.

This early adoption of digital formats inspired and facilitated the development of Ithaca by providing an easily accessible training set for this AI tool. The principal resource used by Assael and colleagues is the Searchable Greek Inscriptions data set of the Packard Humanities Institute in Santa Clarita, California. This is not a random collection of material, but a presentation of 178,551 transcribed texts to which scholarly judgement has already been applied, and both legible words and letters and illegible spaces have been carefully reported. Another enabling tool was the Lexicon of Greek Personal Names at the University of Oxford, UK, a project conceived well before the Internet was born, based on decades of careful scholarship assigning locations and dates to each example of a name used in the ancient Greek world. Ithaca has harnessed this expertise and extends it, mimicking the neural processes of the scholar.

Use of these resources allowed Ithaca to

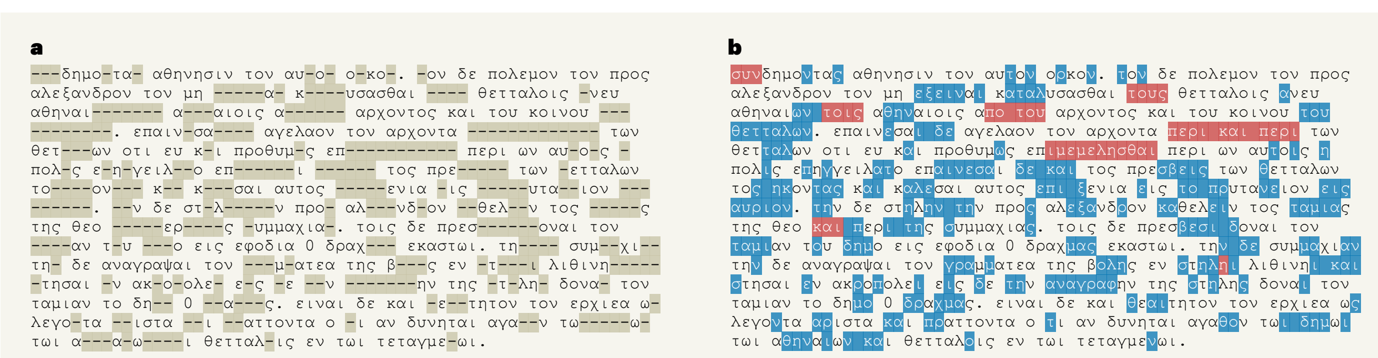

Figure 1 | Predicting missing text in an ancient Greek inscription. **a**, Scholars previously transcribed this fragmented inscription, noting gaps where letters are missing (highlighted dashes). **b**, Assael *et al.*[1] report the development of an artificial-intelligence tool called Ithaca, which is trained to suggest text that might fill these sorts of gaps. The text proposed by Ithaca matches the suggestions previously made by scholars (text highlighted in blue), with a few exceptions (text highlighted in red). The high level of accuracy achieved by Ithaca indicates how it can enhance and enrich the work of scholars. (Figure based on Extended Data Fig. 4 of ref. 1.)