The Economist

Engineering a fix to climate change

Simulating the sense of touch

The web's creator watches it grow up

Technology Quarterly

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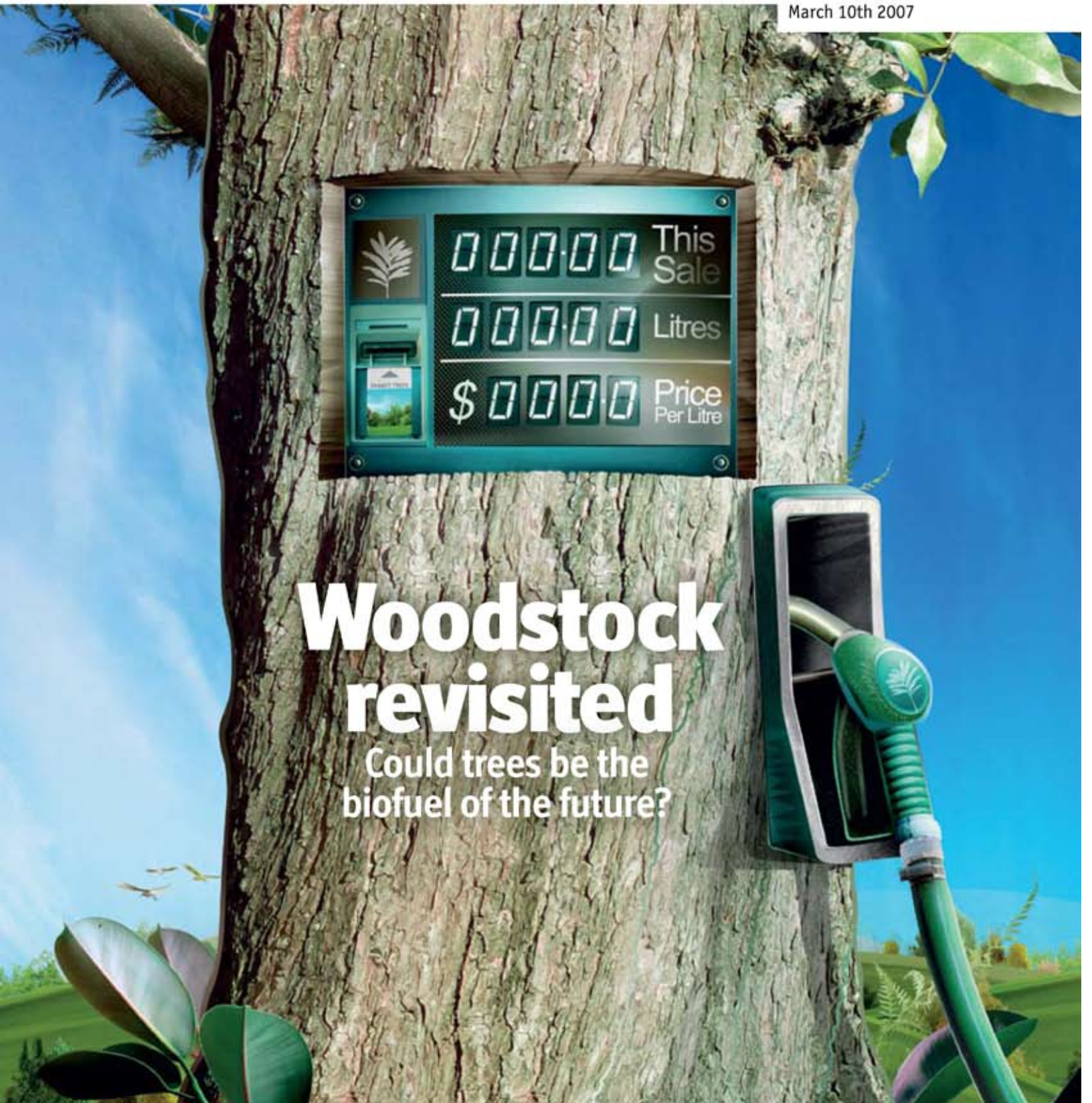
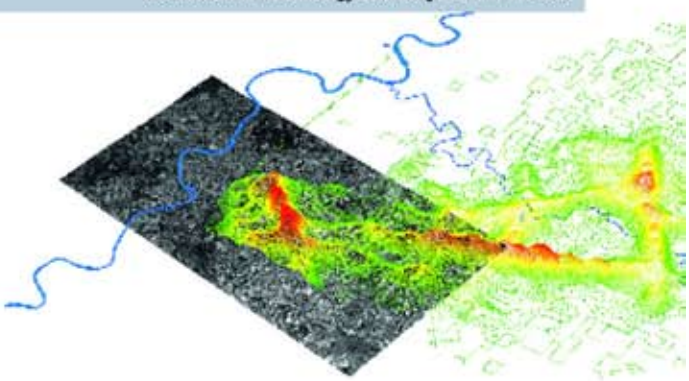


Woodstock revisited

Could trees be the biofuel of the future?



Go with the flow

Visualisation: Data from mobile-phone networks can create maps that show how people are moving around

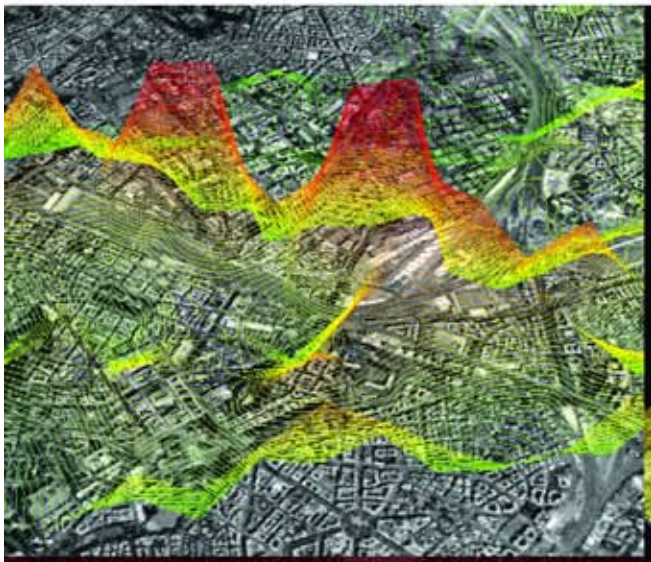
WHERE is everybody? Being able to monitor the flow of people around a city in real time would provide invaluable information to urban planners, transport authorities, traffic engineers and even some businesses. Bus timetables could take account of hourly or daily variations; advertisers would be able to tell which billboards were most valuable. Such information can be collected via traffic helicopters, roadside cameras, police patrols, sensors embedded in roads, tracking units in vehicles, data from public-transport turnstiles and surveys. But the resulting picture is often inadequate, expensive—or both.

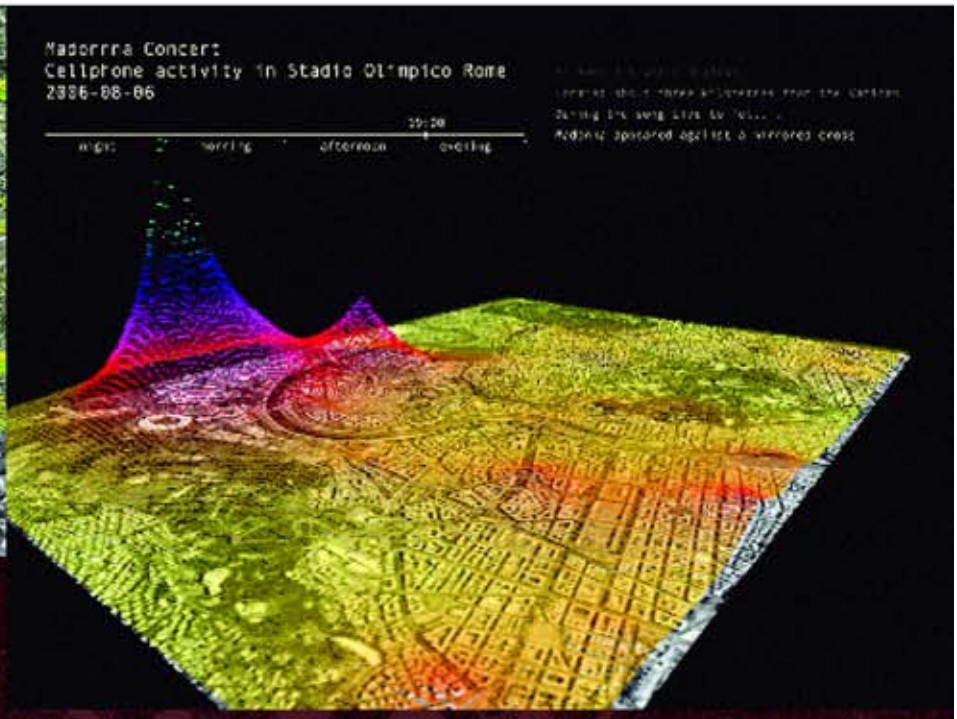
A new scheme devised by researchers at Massachusetts Institute of Technology (MIT) takes a different approach. Given that almost everyone in the developed world now carries a mobile phone, why not use the data from mobile-phone networks? Such networks have to keep track of where subscribers are, as they roam from cell to cell, in order to route calls and text messages. The MIT researchers have been testing the idea using anonymised data from two European operators, Telecom Italia and Mobilkom Austria, to analyse where mobile phones (and therefore people) are at any given moment.

The results take the form of luminous maps adorned with moving and colour-coded arrows, dots and patches of light that indicate the speed and population density of people in the city in question, with an accuracy down to a dozen or so metres. "You see how the city is pulsating," says Carlo Ratti, who is leading the research as head of the SENSEable City Laboratory at MIT.

The new approach has a number of advantages over other methods. Sensors embedded in streets can accurately count vehicles, for example, but cannot count passengers or detect pedestrians and cyclists. Sensors and cameras also fail to provide "origin-destination" (OD) statistics—jargon for information about where people are travelling to and from, and how long their journeys take. Such information is usually collated using surveys, which are very expensive to carry out. Using data from phone networks promises to be much cheaper. "It's pretty simple: you just need a digital map and you show the data," says Hannes Ametsreiter, head of marketing at Mobilkom Austria, which is working with MIT to map the city of Graz. "This could be an opportunity for us."

With markets becoming saturated and mobile operators' revenue-growth slowing—there are already 112 mobile devices for every 100 Austrians, for example—providing information about travel patterns could be a lucrative opportunity for tele- »





Above: Map showing the distribution of mobile-phone users (and hence people) around Rome's Termini station.
Right: A large crowd assembles at Rome's Olympic stadium for a Madonna concert

"People-movement maps could lead to improvements in transport planning, traffic-light placement, signage and road layout."

coms firms. One potential customer is Seat, a firm based in Milan that provides real-time traffic maps that drivers keen to avoid traffic jams can call up on the internet before setting out. The company gathers information from roadside cameras, Italy's national toll-road operator, the police, and satellite-tracking systems installed in more than 220,000 vehicles across Italy. All this costs a lot of money and provides only a partial picture of the state of Italy's roads.

Paolo Cellini, the head of Seat's internet division, says using data from mobile-phone networks instead would dramatically improve the service. He estimates that within two years Seat will sell subscriptions to onboard navigation systems updated in real time with information on traffic levels and average speeds. After that, Seat will provide traffic forecasts produced by correlating past traffic patterns with variables including weather, the date and nearby events, says Mr Cellini. He expects to pay telecoms operators more than €30m ($40m) a year for access to their location data.

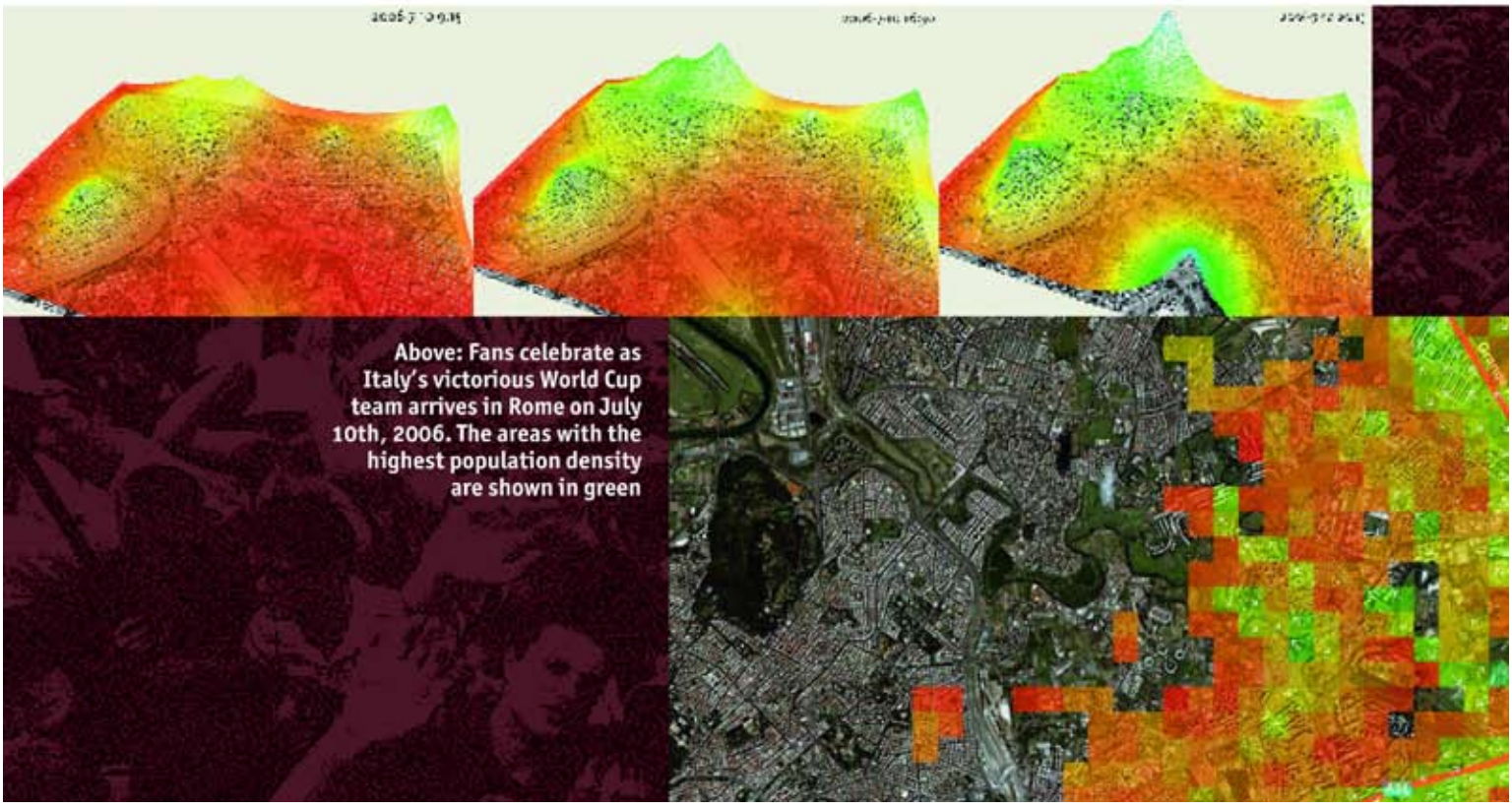
City-planning departments offer another important market, says Ricky Burdett, architecture adviser to the Mayor of London and the director of last year's Venice Architecture Biennale, at which MIT displayed a prototype real-time map of Rome (see picture). London is preparing for a projected additional 1m inhabitants in the next 15 years, and people-movement maps "will be invaluable" in planning housing and transport. Politicians will take to the technology because it can provide solid statistical backing for politically unpopular planning decisions.

Follow the people

It is not hard to think of other uses for the technology. Estate agents, for example, might be better able to appraise commercial property by determining how many pedestrians pass a given storefront. Advertisers would appreciate knowing how many eyeballs pass a hoarding and how those numbers vary between weekdays and weekends. And tourism authorities might change their promotional campaigns abroad after noting which nationalities (identified by their home networks) spend most time in town and which prefer to lie on the beach.

Rome will probably be the first city with commercially available people-movement maps. When MIT presented its project, called Real Time Rome, to Telecom Italia last year, the top management at the Italian telecoms giant gave the scheme its backing. So did Rome's mayor, Walter Veltroni, and the city's transport authority, ATAC. Fulvio Vento, the director of ATAC, says the new system will allow him to scrap an expensive annual OD survey of 2,000 people, which costs more than €60 per respondent to carry out. Mr Vento says the maps will give his planners extraordinary and unprecedented power to shuffle the schedules of Rome's 2,100 buses as demand shifts throughout the day. It could also lead to improvements in traffic-light placement, signage and road layout. Roma Metropolitane, the city authority for Rome's expanding subway network, also says the maps will be a boon to planners.

Samarcanda, a taxi firm based in Rome, is providing free consulting services to the project in return for access to the data. The company's boss, Giovanni Coco, says his drivers still choose their routes based on habit and experience. "It's a disaster," he says, "we need help." Transport planning will provide a ready market, in short, but plenty of other potential uses for the technology are waiting to be discovered. People-movement maps would appear to have a colourful and pulsating future. ■



Above: Fans celebrate as Italy's victorious World Cup team arrives in Rome on July 10th, 2006. The areas with the highest population density are shown in green