

74  
N28/e

# nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

Visual-system  
connectomics —  
from insects to  
mammals

PAGES 154, 168, 175 & 212

## SEEING THE WORLD

ETHICS

### HENRIETTA'S LEGACY

NIH and Lacks' family forge HeLa data-access policy

PAGES 141 & 207

SUSTAINABILITY

### CHINESE REVOLUTION

A low-carbon road map for China

PAGE 143

MAMMALIAN ORIGINS

### THE MORE THE MURKIER

Fresh fossil discoveries add new layers of complexity

PAGES 160, 163 & 199

NATURE.COM/NATURE

8 August 2013 £10

Vol. 500, No. 7461





# CONTENTS

8 August 2013 / Vol 500 / Issue No 7461

## THIS WEEK

### EDITORIALS

#### 121 INFLUENZA

##### Handle with care

Work to protect us from a flu pandemic carries a high level of risk

#### 121 RESEARCH

##### Blood ties

Better feedback for research participants would enhance science

### WORLD VIEW

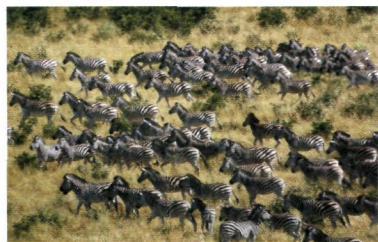
#### 123 Balancing privacy with public benefit

*Martin Bobrow*

Access to research data offers huge benefits to science — as long as it is properly controlled

### RESEARCH HIGHLIGHTS

#### 124 SELECTIONS FROM THE SCIENTIFIC LITERATURE



Zebra weather forecasts / Lead-heavy stars / Mob mentality in ants / Truth and lies among orchids / Acidification of shipping routes

### SEVEN DAYS

#### 126 THE NEWS IN BRIEF

- Uruguay edges towards legalized marijuana / Double coffin surprises archaeologists / Artificial beef burger makes its debut / NSF and NOAA heads nominated

## CAREERS

#### 243 DATA-SHARING

##### Everything on display

Making your results readily available in the most appropriate formats is crucial for a successful research career

#### 245 TURNING POINT

Sustainability researcher Kevin Gurney on the arcane world of climate-policy negotiation

## NEWS IN FOCUS



#### 129 POLITICS

Turkish scientists sentenced despite allegations of unfair trials

#### 130 ANIMAL RESEARCH

Biologists seek consensus on most humane way to dispatch lab animals

#### 131 OPTICS

Squeezed light reduces noise and pulls sharper focus

#### 132 ETHICS

NIH builds bridges with family of Henrietta Lacks

#### 135 ASTROPHYSICS

X-ray emissions put a figure on black hole spin

## FEATURES

#### 138 EXOTIC OPTICS

##### Metamaterial world

Engineered structures with bizarre properties are making the move from lab to market



#### CLIMATE SCIENCE

## A line in the sands

Canada's proposed tar sands pipeline proves divisive **PAGE 136**

## COMMENT



#### ETHICS

## Family matters

*Kathy L Hudson & Francis S Collins*

HeLa cell-line genomic data now available — with restrictions — thanks to unique negotiations **PAGE 141**

#### 143 SUSTAINABILITY

##### A low-carbon road map for China

*Zhu Liu, Dabo Guan, Douglas Crawford-Brown, Qiang Zhang, Kebin He & Jianguo Liu*

China is well placed to lead the way towards effective climate-change mitigation

#### BOOKS & ARTS

#### 147 SOCIAL PSYCHOLOGY

##### The goat factor

*Dan Jones*

#### 148 DEVELOPMENT

##### Starved for solutions

*Calestous Juma*

#### 149 SCIENCE AND RELIGION

##### Godless chronicles

*Glenn Branch*

#### CORRESPONDENCE

150 Influenza H7N9 experiments / Pay cuts for US science staff? / The problems with eco-labels



#### FUTURES

248 One meal a day  
*Milo James Fowler*



# CONTENTS

8 August 2013 / Vol 500 / Issue No 7461

## RESEARCH

### NEW ONLINE

153 Papers published this week at nature.com

### NEWS & VIEWS

#### 154 NEUROSCIENCE

##### Accurate maps of visual circuitry

Connectomic and optical analyses of neural circuitries in the retina

Richard H Masland [SEE ARTICLES P.168, P.175 & LETTER P.212](#)

#### 155 SOLAR SYSTEM

##### Saturn's tides control Enceladus' plume

Relationship between Enceladus' orbital position and plume brightness

John Spencer [SEE LETTER P.182](#)

#### 157 BIOCHEMISTRY

##### Curbing the excesses of low demand

An excretion mechanism for metabolic control

Athel Cornish-Bowden [SEE LETTER P.237](#)

#### 158 EVOLUTIONARY BIOLOGY

##### The handiwork of tinkering

Identifying human-specific gene regulation during limb development

Paul Flicek

#### 159 CLIMATE SCIENCE

##### Solution proposed for ice-age mystery

The factors that triggered the most recent deglaciation

Shawn J Marshall [SEE LETTER P.190](#)

#### 160 PALAEOLOGY

##### Jurassic fossils and mammalian antiquity

Two new haramiyidan fossils from the Jurassic period

Richard L Cifelli & Brian M Davis

[SEE ARTICLE P.163 & LETTER P.199](#)

### ARTICLES

#### 163 EVOLUTION A Jurassic mammaliaform and the earliest mammalian evolutionary adaptations

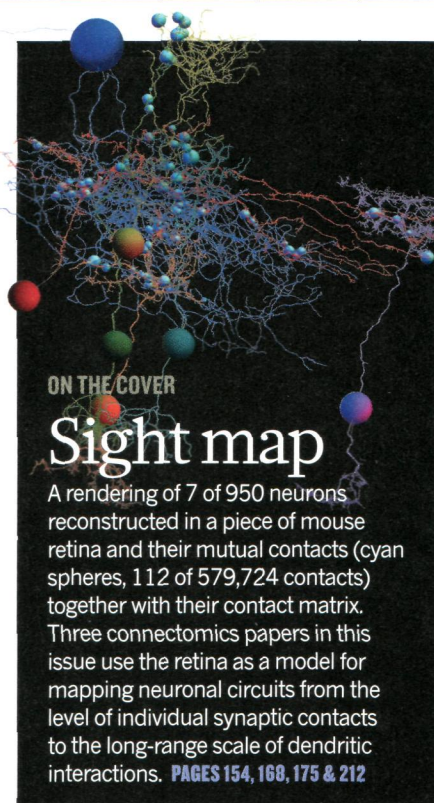
C-F Zhou, S Wu, T Martin & Z-X Luo

[SEE N&V P.160](#)

#### 168 NEUROSCIENCE Connectomic reconstruction of the inner plexiform layer in the mouse retina

M Helmstaedter et al. [SEE N&V P.154](#)

#### 175 NEUROSCIENCE A visual motion detection circuit suggested by



ON THE COVER

## Sight map

A rendering of 7 of 950 neurons reconstructed in a piece of mouse retina and their mutual contacts (cyan spheres, 112 of 579,724 contacts) together with their contact matrix. Three connectomics papers in this issue use the retina as a model for mapping neuronal circuits from the level of individual synaptic contacts to the long-range scale of dendritic interactions. [PAGES 154, 168, 175 & 212](#)

#### *Drosophila* connectomics

S-y Takemura et al. [SEE N&V P.154](#)

### LETTERS

182 **PLANETARY SCIENCE** An observed correlation between plume activity and tidal stresses on Enceladus  
M M Hedman et al. [SEE N&V P.155](#)

185 **OPTICS** Squeezed light from a silicon micromechanical resonator  
A H Safavi-Naeini et al.

190 **CLIMATE SCIENCE** Insolation-driven 100,000-year glacial cycles and hysteresis of ice-sheet volume  
A Abe-Ouchi et al. [SEE N&V P.159](#)

194 **ECOLOGY** Nitrogen losses in anoxic marine sediments driven by *Thioploca*-anammox bacterial consortia  
M G Prokopenko et al.

199 **PALAEOLOGY** A new arboreal haramiyid shows the diversity of crown mammals in the Jurassic period  
X Zheng, S Bi, X Wang & J Meng  
[SEE N&V P.160](#)

203 **MOLECULAR EVOLUTION** A latent capacity for evolutionary innovation through exaptation in metabolic systems  
A Barve & A Wagner

207 **GENETICS** The haplotype-resolved genome and epigenome of the aneuploid HeLa cancer cell line  
A Adey et al.

212 **NEUROSCIENCE** A directional tuning map of *Drosophila* elementary motion detectors  
M S Maisak et al. [SEE N&V P.154](#)

217 **STEM CELLS** Generation of inner ear sensory epithelia from pluripotent stem cells in 3D culture  
K R Koehler, A M Mikosz, A I Molosh, D Patel & E Hashino

222 **EPIGENETICS** Vitamin C induces Tet-dependent DNA demethylation and a blastocyst-like state in ES cells  
K Blaschke et al.

227 **VIROLOGY** Molecular basis of binding between novel human coronavirus MERS-CoV and its receptor CD26  
G Lu et al.

232 **IMMUNOLOGY** T<sub>reg</sub> induction by a rationally selected mixture of Clostridia strains from the human microbiota  
K Atarashi et al.

237 **CHEMICAL BIOLOGY** Pyrimidine homeostasis is accomplished by directed overflow metabolism  
M L Reaves, B D Young, A M Hosios, Y-F Xu & J D Rabinowitz [SEE N&V P.157](#)

242 **CORRIGENDUM** Domain organization of human chromosomes revealed by mapping of nuclear lamina interactions  
L Guelen et al.

242 **CORRIGENDUM** Immune surveillance by CD8 $\alpha^+$  skin-resident T cells in human herpes virus infection  
J Zhu et al.

242 **ERRATUM** Integrated genomic characterization of endometrial carcinoma  
The Cancer Genome Atlas Research Network