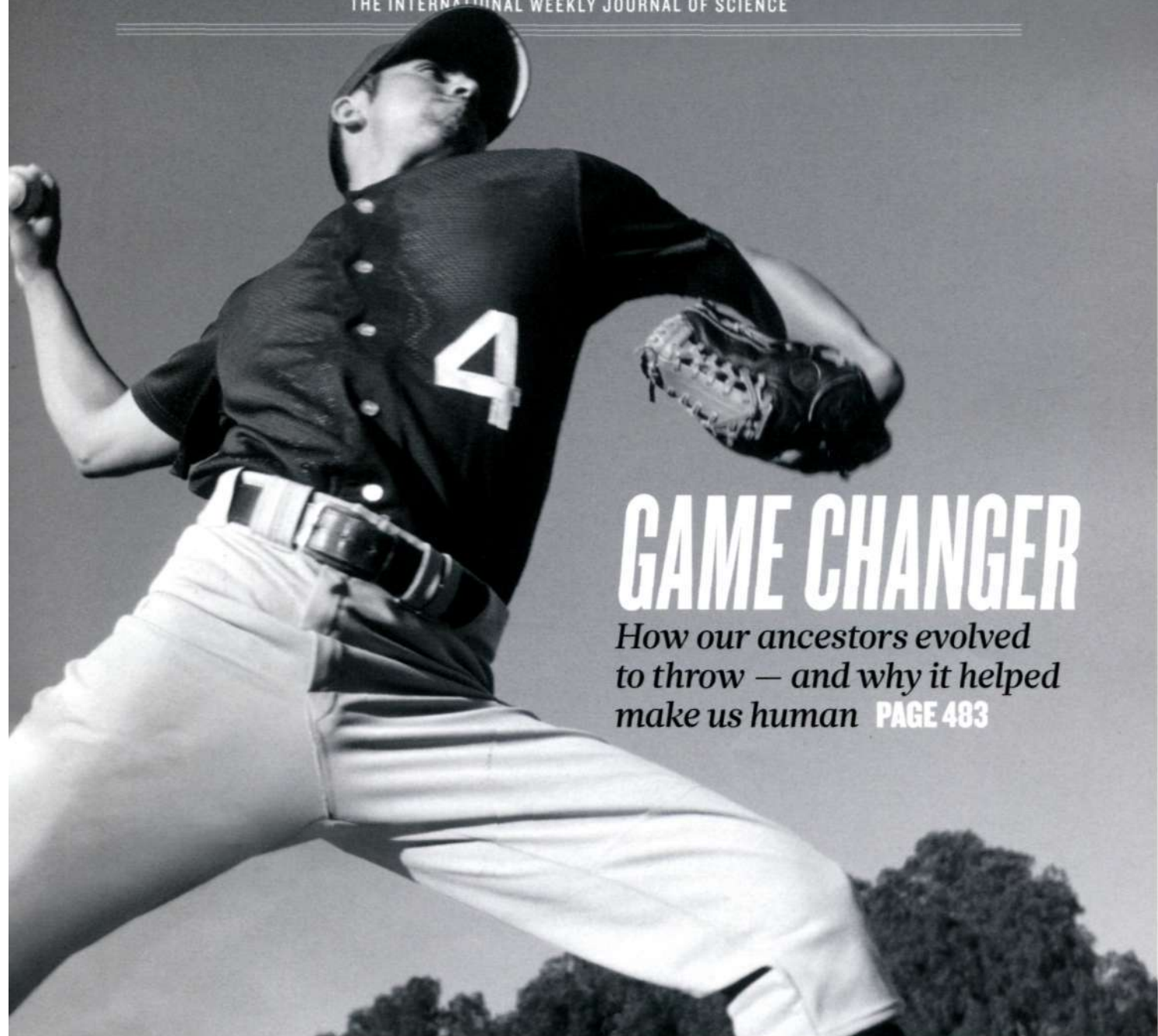


nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE



GAME CHANGER

How our ancestors evolved to throw — and why it helped make us human **PAGE 483**

ENVIRONMENT

ACID TEST FOR THE OCEANS

Larger studies to gauge impacts of climate change

PAGES 420 & 429

CELL LINES

FETAL POSITION

WI-38 — the controversial mainstay of vaccine makers

PAGE 422

PUBLIC HEALTH

WAKE-UP CALL

Under-investment in sleep research costs us dear

PAGE 427

NATURE.COM/NATURE

27 June 2013 £10

Vol. 498, No. 7455



9 770028 083095

CONTENTS

27 June 2013 / Vol 498 / Issue No 7455

THIS WEEK

EDITORIALS

407 MEDICAL RESEARCH

A culture of consent

The rules covering human subjects in research are ripe for a revamp

408 GENOMICS

Family first

Better sequencing techniques offer a fresh take on personal genomics

408 HEALTH

How do you sleep?

It is time to wake up and find out more about sleep

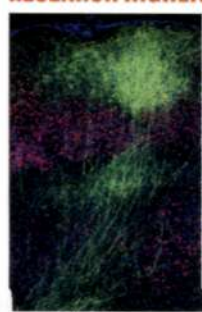
WORLD VIEW

409 Europe should rethink its stance on GM crops

Brian Heap

Science, not bias and mistrust, should determine GM crop policy

RESEARCH HIGHLIGHTS



410 SELECTIONS FROM THE SCIENTIFIC LITERATURE

Losing the evolutionary race / Vegetable time / Wall of sound / Fruitflies to go / Less pollution — more hurricanes / Stone Age shellfish diet

SEVEN DAYS

412 THE NEWS IN BRIEF

Indonesian fires pollute neighbouring countries / Fermilab appoints new head / NASA announces next class of astronauts / Physicist Kenneth Wilson dies

CAREERS

527 FUNDING

Flirting with disaster

The US research establishment is being transformed by federal retrenchment

529 TURNING POINT

We need more small, cheap spacecraft, says their designer, Riccardo Bevilacqua

529 CAREER BRIEFS

NEWS IN FOCUS

415 ENERGY

Shale-gas extraction linked to residues in groundwater

416 ELECTROCHEMISTRY

Sulphur makes a comeback in the battle of the batteries

417 INFECTIOUS DISEASE

Trial planned to assess HIV 'cure' in children



418 PERSONAL GENOMICS

A diagnosis at last for father seeking to understand his daughter's condition

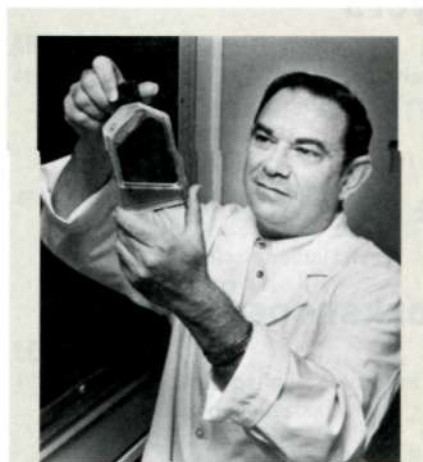
419 PHYSICS

Greater certainty over uncertainty principle

420 MARINE ECOLOGY

Ocean labs assess effects of acidification on marine ecosystems

FEATURES



MEDICAL RESEARCH

Cell division

The story of controversial cell line WI-38, source of many vaccines

PAGE 422

COMMENT

427 CHRONOBIOLOGY

The human sleep project

Till Roenneberg

Health and happiness of millions would improve if we knew more about sleep

429 MARINE SCIENCE

Get ready for ocean acidification

Sam Dupont & Hans Pörtner

We need to identify at-risk ecosystems in the oceans — and to protect them

BOOKS & ARTS



HISTORY

Leading light

The story of the Fresnel lens shows the power of invention, says Joanne Baker **PAGE 430**

431 BOOKS IN BRIEF

432 SCIENCE FICTION

Broken brains and runaway technology

Jennifer Rohn

433 Q&A

Sound chaser

Bill Fontana

CORRESPONDENCE

434 UK badger cull / An InterAcademy

Panel / Nuclear power in Brazil / Australian biodiversity under threat / American football rules

OBITUARY

435 Joe Farman (1930–2013)

John Pyle & Neil Harris

FUTURES

532 Probability-1: termination

Euan Nisbet

CONTENTS

27 June 2013 / Vol 498 / Issue No 7455

RESEARCH

NEW ONLINE

437 Papers published this week at nature.com

NEWS & VIEWS

438 QUANTUM PHYSICS

Spooky action gets collective

Entanglement between an atomic collective excitation and a photon
Matthias Weidemüller

SEE LETTER P.466

439 REGENERATIVE BIOLOGY

Heartbroken embryos heal

Atrial-cell-derived ventricular cells in zebrafish

Kenneth R Chien SEE LETTER P.497

440 APPLIED PHYSICS

Cloaking of heat

A thermal cloaking device
Ulf Leonhardt

441 NEUROSCIENCE

Stem cells in multiple time zones

Transcription-factor cascades control temporal specification of neuroblasts
Stefan Thor

SEE ARTICLES P.449 & P.456

443 ELECTRONICS

The road to carbon nanotube transistors

Advances in the purification and positioning of carbon nanotubes
Aaron D Franklin

444 CELL SIGNALLING

Nutrient sensing lost in cancer

Amino-acid levels affect mTORC1-mediated growth in cells

Suchithra Menon & Brendan D Manning

446 ANIMAL BEHAVIOUR

Brain food

Energetic stress impairs cognitive function in honeybees

Marian Turner

446 EPIDEMIOLOGY

Resistance mapping in malaria

Parasite sequencing reveals candidate artemisinin-resistance genes

A Taylor Bright & Elizabeth A Winzeler

447 PHOTONICS

An ultra-small silicon laser

A Raman silicon laser that operates at microwatt power levels

Roel Baets SEE LETTER P.470



ON THE COVER

Throwback

Analysis of the biomechanics of collegiate baseball players' throwing motion shows that adaptations in the upper body allow us to store and release elastic energy in the shoulder in a catapult-like fashion. Evidence of key morphology shifts that make this possible — and differentiate humans from non-human primates — is preserved in the fossil record. **PAGE 403**

ARTICLES

449 **DEVELOPMENTAL BIOLOGY** Combinatorial temporal patterning in progenitors expands neural diversity

O A Bayraktar & C Q Doe SEE N&V P.441

456 **DEVELOPMENTAL BIOLOGY** Temporal patterning of *Drosophila* medulla neuroblasts controls neural fates

X Li et al. SEE N&V P.441

LETTERS

463 **ASTRONOMY** Multi-periodic pulsations of a stripped red-giant star in an eclipsing binary system

P F L Maxted et al.

466 **PHYSICS** Entanglement between light and an optical atomic excitation

L Li, Y O Dudin & A Kuzmich SEE N&V P.438

470 **PHOTONICS** A micrometre-scale Raman silicon laser with a microwatt threshold

Y Takahashi et al. SEE N&V P.447

475 **EARTH SCIENCES** Lifespan of mountain ranges scaled by feedbacks between landsliding and erosion by rivers

D L Egholm, M F Knudsen & M Sandiford

479 **GEODYNAMICS** Stability of active mantle upwelling revealed by net characteristics of plate tectonics

C P Conrad, B Steinberger & T H Torsvik

483 **EVOLUTION** Elastic energy storage in the shoulder and the evolution of high-speed throwing in *Homo*

N T Roach, M Venkadesan, M J Rainbow & D E Lieberman

487 **NEUROBIOLOGY** *orco* mutant mosquitoes lose strong preference for humans and are not repelled by volatile DEET

M DeGennaro et al.

492 **CELL BIOLOGY** *EndMT* contributes to the onset and progression of cerebral cavernous malformations

L Maddaluno et al.

497 **DEVELOPMENTAL BIOLOGY** *In vivo* cardiac reprogramming contributes to zebrafish heart regeneration

R Zhang et al. SEE N&V P.439

502 **IMMUNE EVASION** Severe malaria is associated with parasite binding to endothelial protein C receptor

L Turner et al.

506 **IMMUNOLOGY** *BACH2* represses effector programs to stabilize T_{reg} -mediated immune homeostasis

R Roychoudhuri et al.

511 **MOLECULAR BIOLOGY** *Rev-Erbs* repress macrophage gene expression by inhibiting enhancer-directed transcription

M T Y Lam et al.

516 **MOLECULAR BIOLOGY** Functional roles of enhancer RNAs for oestrogen-dependent transcriptional activation

W Li et al.

521 **STRUCTURAL BIOLOGY** Unusual architecture of the p7 channel from hepatitis C virus

B OuYang et al.

526 **CORRIGENDUM** Functional organization of human sensorimotor cortex for speech articulation

K E Bouchard et al.

526 **CORRIGENDUM** Human contribution to more-intense precipitation extremes

S-K Min, X Zhang, F W Zwiers & G C Hegerl

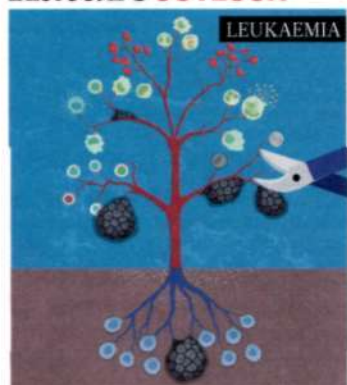
CORBIS

OUTLOOK

Supplement to 27 June 2013/ Vol 498 / Issue No 7455

LEUKAEMIA

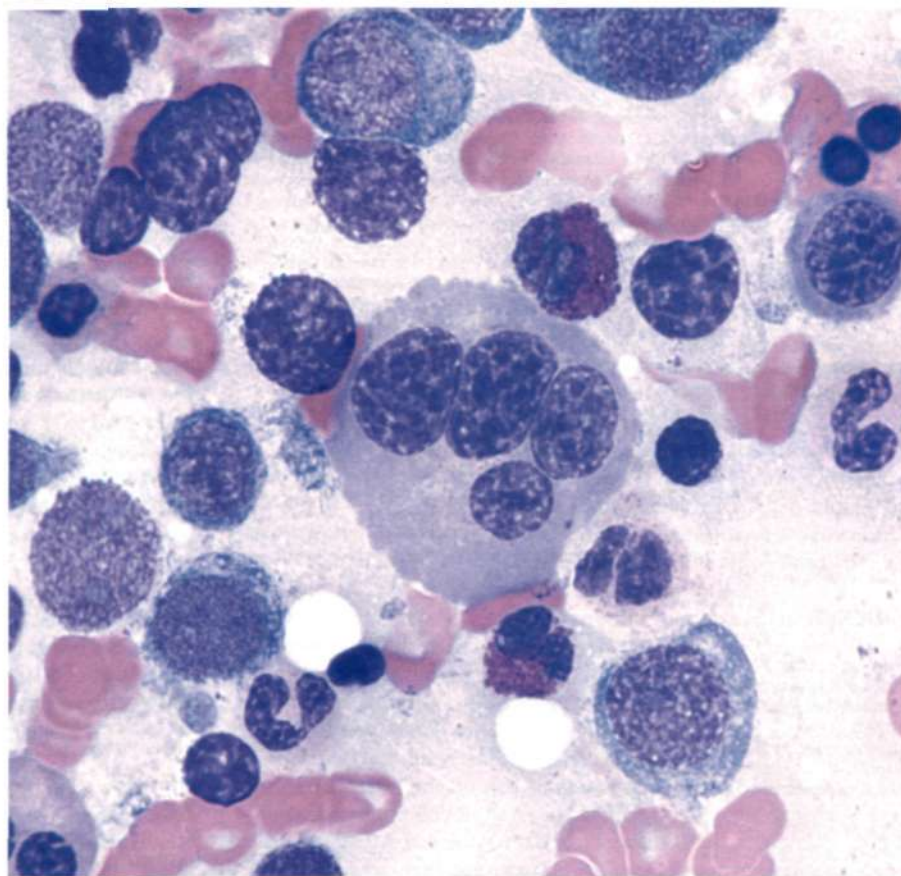
natureOUTLOOK



Getting to the root of blood cancers

Produced with support from
NOVARTIS Baxter GSK

Turn to page 436



Cells from a patient with myelodysplastic syndrome may help researchers understand leukaemia (page S4).

S1 EDITORIAL

Leukaemia

Apoorva Mandavilli

S2 ONCOLOGY

Living with leukaemia

How does the disease start, and how is it treated?

S4 GENETICS

Written in blood

Cracking leukaemia's genetic code

S7 PERSPECTIVE

Combined forces

Several drugs at once is the key to beating treatment resistance

S8 DRUG DEVELOPMENT

Target practice

Designing clinical trials to improve leukaemia treatments

S10 EPIGENETICS

Reversible tags

Mutated enzymes can cause cancer too

S12 STEM CELLS

Bad seeds

Effective treatments must eliminate any leukemic cells lying dormant

S14 DRUG SAFETY

Double jeopardy

Finding ways to cure leukaemia without causing lifelong health problems

S16 CELL BANKS

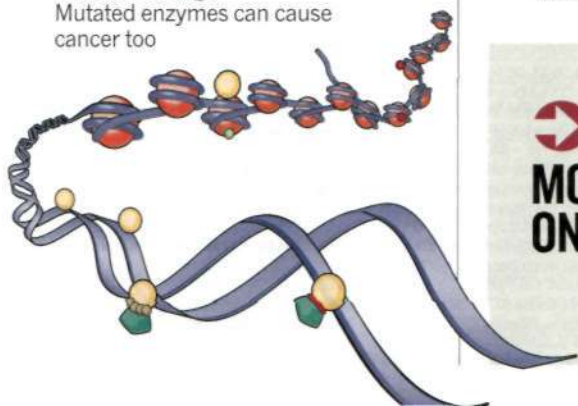
Life blood

Stem cells from the umbilical cord are the latest weapon against leukaemia

S17 PERSPECTIVE

Assembly line immunotherapy

Better ways to mass produce immune cells that can eradicate cancer



NATURE VIDEO & COLLECTION



MORE ONLINE

Leukaemia is a major malfunction in the production of blood cells. Nature Video looks inside the broken machinery to see what goes awry in the main forms of this cancer:

go.nature.com/rpnw28

