Combatting parasitic worms

SPECIAL SECTION
Robots

INTRODUCTION
178 The social life of robots

NEWS
180 Meet your new co-worker
By J. Bohannon

182 Minds of their own
By R. F. Service

184 Getting a feel for the world
By H. DuRant and J. You

186 Helping robots see the big picture
By J. Bohannon

188 In our own image
By D. Normile

190 Humans need not apply
By H. DuRant and J. You

192 The accidental roboticist
By A. Cho

195 Q&A: Robots and the law
By D. Normile

REVIEW
196 Biorobotics: Using robots to emulate and investigate agile locomotion
A. J. Ipspeert

SEE ALSO
➤ PERSPECTIVE P. 160
➤ REPORT P. 224
➤ PODCAST
➤ VIDEO
➤ SLIDESHOW
➤ SCIENCE TRANSLATIONAL MEDICINE:
3 RELATED ARTICLES; 8 OCT 2014
➤ SCIENCE CAREERS
➤ WORKING LIFE P. 274
➤ sciencemag.org/special/robotics

ON THE COVER
Robotics engineer Hiroshi Ishiguro and his mechanical doppelganger “Geminoid.” No matter how uncannily human some of today’s robots may seem, the resemblance is skin deep. An ongoing challenge is endowing robots with the capability to sense their environment and the wits to comprehend it. See page 178. Photo: Osaka University

NEWS

IN BRIEF
146 Roundup of the week’s news

IN DEPTH
148 STEM CELL RECIPE OFFERS DIABETES HOPE
Researchers coax stem cells into becoming long-sought insulin-producing β cells By G. Vogel

149 THE BRAIN’S GPS FINDS TOP HONOR
Three earn physiology or medicine Nobel for discovering “place” and “grid” cells By E. Underwood

149 PHYSICISTS CHANGE THE LIGHT BULB
Blue LEDs win 2014 physics Nobel By D. Normile

150 A CALL FOR AN NIH YOUTH MOVEMENT
Wariness greets congressman’s proposal to require agency to reduce average age at first grant By J. Kaiser

151 IMAGINING EBOLA’S NEXT MOVE
Scientists look beyond the models to envision how the epidemic might unfold By K. Kupferschmidt

152 CONGRESS, NSF SPAR ON ACCESS TO GRANT FILES
Grantees wonder what science panel will do with private award details By J. Mervis

FEATURES
154 DON’T BLAME THE BEETLES
Beetle-killed trees aren’t necessarily fueling more severe fires in the west By C. Carsewell

157 RACING THE THAW
A trove of artifacts is emerging from alpine ice By A. Curry

162 PLANT SYNTHETIC BIOLOGY TAKES ROOT
Applying the basic principles of synthetic biology to plants shows progress By J. I. Medford and A. Prasad

163 ADJUSTING TO THE FERTILITY BUST
What is the best response to declining populations? By T. M. Smeeding
➤ REPORTS PP. 229 & 234

165 CATCHING THE QUANTUM SOUND WAVE
A superconducting qubit built to listen as well as see By R. Ruskov and C. Tahan
➤ RESEARCH ARTICLE P. 207

INSIGHTS

PERSPECTIVES
160 OF SNAKES AND ROBOTS
How can snakes and robots move up sandy slopes? By J. J. Socha
➤ ROBOTS SECTION P. 178; REPORT P. 224

162 PLANT SYNTHETIC BIOLOGY TAKES ROOT
Applying the basic principles of synthetic biology to plants shows progress By J. I. Medford and A. Prasad

163 ADJUSTING TO THE FERTILITY BUST
What is the best response to declining populations? By T. M. Smeeding
➤ REPORTS PP. 229 & 234

165 CATCHING THE QUANTUM SOUND WAVE
A superconducting qubit built to listen as well as see By R. Ruskov and C. Tahan
➤ RESEARCH ARTICLE P. 207
166 TAKING THE MEASURE OF CHANGE
Predictive models of biodiversity change are required to inform conservation policy decisions By B. Cullen and E. Nicholson

168 HALTING HARMFUL HELMINTHS
Vaccines and new drugs are needed to combat parasitic worm infections By K. F. Hoffman et al.

169 ATTACK OF THE CLONES
What makes lung cancer so resilient? By R. Govindan

170 AMPLIFY SCIENTIFIC DISCOVERY WITH ARTIFICIAL INTELLIGENCE
Many human activities are a bottleneck in progress By Y. Gil et al.

BOOKS ET AL.
173 MARS UP CLOSE
By M. Kaufmann, reviewed by M. Moerchen

173 THE ISLAND OF KNOWLEDGE
By M. Gleiser, reviewed by M. A. Goldman

174 THE REMEDY
By T. Goetz, reviewed by M. Maheu-Giroux

LETTERS
175 ALGAL BLOOMS: NOTEWORTHY NITROGEN
By H. W. Page et al.

175 ALGAL BLOOMS: PROACTIVE STRATEGY
By M. Qu et al.

176 OCEAN ACIDIFICATION FOILS CHEMICAL SIGNALS
By T. D. Wyatt et al.

176 TECHNICAL COMMENT ABSTRACTS

RESEARCH ARTICLE
207 QUANTUM PROCESSING
Propagating phonons coupled to an artificial atom M. V. Gustafsson et al.

REPORTS
212 PLANETARY DYNAMICS
A class of warm Jupiters with mutually inclined, apsidally misaligned close friends R. I. Davison and E. Chiang

216 EARLY UNIVERSE
A local clue to the reionization of the universe S. Borthakur et al.

219 ORGANIC SYNTHESIS
Asymmetric syntheses of sceptrin and massadine and evidence for biosynthetic enantiodivergence Z. Ma et al.

224 ANIMAL MOTION
Sidewing with minimal slip: Snake and robot ascent of sandy slopes H. Marvi et al.

229 ECONOMIC DEMOGRAPHY
Is low fertility really a problem? Population aging, dependency, and consumption R. Lee et al.

234 WORLD POPULATION
World population stabilization unlikely this century P. Gerland et al.

237 ADULT NEUROGENESIS
A latent neurogenic program in astrocytes regulated by Notch signaling in the mouse J. P. Magnusson et al.

241 CONSERVATION TARGETS
A mid-term analysis of progress toward international biodiversity targets D. P. Tittensor et al.

244 CELL-FREE ASSAYS
Spatial organization of cytokinesis signaling reconstituted in a cell-free system P. A. Nguyen et al.

248 YEAST MEIOSIS
Sister kinetochores are mechanically fused during meiosis I in yeast K. K. Sarangapani et al.

LUNG CANCER EVOLUTION
251 Spatial and temporal diversity in genomic instability processes defines lung cancer evolution E. C. de Bruin et al.

256 Intratumor heterogeneity in localized lung adenocarcinomas delineated by multiregion sequencing J. Zhang et al.

DEPARTMENTS
145 EDITORIAL
Five years of translation By Katrina L. Kelner and Mareia McNutt

274 WORKING LIFE
Building the Bionic Woman By Ayanna Howard

10 OCTOBER 2014 • VOLUME 346 • ISSUE 6206

RESEARCH IN BRIEF
204 From Science and other journals

165 & 207

234 WORLD POPULATION
World population stabilization unlikely this century P. Gerland et al.

237 ADULT NEUROGENESIS
A latent neurogenic program in astrocytes regulated by Notch signaling in the mouse J. P. Magnusson et al.

241 CONSERVATION TARGETS
A mid-term analysis of progress toward international biodiversity targets D. P. Tittensor et al.

244 CELL-FREE ASSAYS
Spatial organization of cytokinesis signaling reconstituted in a cell-free system P. A. Nguyen et al.

248 YEAST MEIOSIS
Sister kinetochores are mechanically fused during meiosis I in yeast K. K. Sarangapani et al.

LUNG CANCER EVOLUTION
251 Spatial and temporal diversity in genomic instability processes defines lung cancer evolution E. C. de Bruin et al.

256 Intratumor heterogeneity in localized lung adenocarcinomas delineated by multiregion sequencing J. Zhang et al.

DEPARTMENTS
145 EDITORIAL
Five years of translation By Katrina L. Kelner and Mareia McNutt

274 WORKING LIFE
Building the Bionic Woman By Ayanna Howard

10 OCTOBER 2014 • VOLUME 346 • ISSUE 6206

143