

Cover image: Altered skin innervation in the hind paw of a *Bbs1*^{-/-} and *Bbs4*^{-/-} mutant mouse. The deleted genes code for proteins in the basal bodies of sensory neurons and are mutated in humans with Bardet–Biedl syndrome, who suffer from deficits in hearing, vision, and smell. See the article by Tan *et al.* on pages 17524–17529. Image courtesy of Nicholas Katsanis.

From the Cover

- 17524 Cilia and sensation
- 17278 Greenland dust echoes Antarctic climate
- 17358 Leptin controls metabolism in brain
- 17441 Variation in HIV viral load
- 17447 *PROK2* key in sexual development

Contents

THIS WEEK IN PNAS

17241 In This Issue

COMMENTARIES

- 17243 **The tangled web of self-tying knots**
Andrew Belmonte
→ See companion article on page 16432 in issue 42 of volume 104
- 17245 **PP2A as a mercenary for warring kinases in the egg**
Hongtao Yu
→ See companion article on page 16564 in issue 42 of volume 104
- 17247 **Rites of passage through puberty: A complex genetic ensemble**
J. Larry Jameson
→ See companion article on page 17447

PROFILES

- 17249 **Profile of Eugenia M. del Pino**
Kaspar Mossman
→ See Inaugural Article on page 11882 in issue 29 of volume 104

 Freely available online through the PNAS open access option.

17252 Profile of Christian R. H. Raetz

Nick Zagorski

→ See Inaugural Article on page 13543 in issue 34 of volume 104


PHYSICAL SCIENCES

APPLIED PHYSICAL SCIENCES

- 17255  **Confocal light absorption and scattering spectroscopic microscopy monitors organelles in live cells with no exogenous labels**
Irving Itzkan, Le Qiu, Hui Fang, Munir M. Zaman, Edward Vitkin, Ionita C. Ghiran, Saira Salahuddin, Mark Modell, Charlotte Andersson, Lauren M. Kimerer, Patsy B. Cipolloni, Kee-Hak Lim, Steven D. Freedman, Irving Bigio, Benjamin P. Sachs, Eugene B. Hanlon, and Lev T. Perelman
- 17364 **Switchable DNA interfaces for the highly sensitive detection of label-free DNA targets**
Ulrich Rant, Kenji Arinaga, Simon Scherer, Erika Pringsheim, Shozo Fujita, Naoki Yokoyama, Marc Tornow, and Gerhard Abstreiter
- 17370  **Dynamic clustered distribution of hemagglutinin resolved at 40 nm in living cell membranes discriminates between raft theories**
Samuel T. Hess, Travis J. Gould, Manasa V. Gudheti, Sarah A. Maas, Kevin D. Mills, and Joshua Zimmerberg
- CHEMISTRY**
- 17261 **Picosecond fluctuating protein energy landscape mapped by pressure–temperature molecular dynamics simulation**
Lars Meinhold, Jeremy C. Smith, Akio Kitao, and Ahmed H. Zewail

- 17266 **Efficient production of [n]rotaxanes by using template-directed clipping reactions**
Jishan Wu, Ken Cham-Fai Leung,
and J. Fraser Stoddart
- 17272 **Chemical evolution: The mechanism of the formation of adenine under prebiotic conditions**
Debjani Roy, Katayoun Najafian,
and Paul von Ragué Schleyer


ENGINEERING

- 17376 **Analysis of nematode mechanics by piezoresistive displacement clamp**
 Sung-Jin Park, Miriam B. Goodman, and Beth L. Pruitt

GEOLOGY

- 17278 **Antarctic climate signature in the Greenland ice core record**
Stephen Barker and Gregor Knorr

PHYSICS

- 17283 **Structural motifs of biomolecules**
Jayanth R. Banavar, Trinh Xuan Hoang, John H. Maddocks, Amos Maritan, Chiara Poletto, Andrzej Stasiak, and Antonio Trovato
- 17287 **Nonstationary increments, scaling distributions, and variable diffusion processes in financial markets**
Kevin E. Bassler, Joseph L. McCauley,
and Gemunu H. Gunaratne
- 17291 **Optimal approach to quantum communication using dynamic programming**
 Liang Jiang, Jacob M. Taylor, Navin Khaneja,
and Mikhail D. Lukin
- 17297 **Structure of sodium above 100 GPa by single-crystal x-ray diffraction**
M. I. McMahan, E. Gregoryanz, L. F. Lundegaard,
I. Loa, C. Guillaume, R. J. Nelmes, A. K. Kleppe,
M. Amboage, H. Wilhelm, and A. P. Jephcoat
- 17382 **Mechanical control of the directional stepping dynamics of the kinesin motor**
Changbong Hyeon and José N. Onuchic

SOCIAL SCIENCES

ECONOMIC SCIENCES

- 17287 **Nonstationary increments, scaling distributions, and variable diffusion processes in financial markets**
Kevin E. Bassler, Joseph L. McCauley,
and Gemunu H. Gunaratne

SOCIAL SCIENCES



- 17435 **Gossip as an alternative for direct observation in games of indirect reciprocity**
Ralf D. Sommerfeld, Hans-Jürgen Krambeck,
Dirk Semmann, and Manfred Milinski

BIOLOGICAL SCIENCES





APPLIED BIOLOGICAL SCIENCES

- 17300 **Engineered bidirectional communication mediates a consensus in a microbial biofilm consortium**
Katie Brenner, David K. Karig, Ron Weiss,
and Frances H. Arnold

BIOCHEMISTRY

- 17305 **ephrinB1 signals from the cell surface to the nucleus by recruitment of STAT3**
Yong-Sik Bong, Hyun-Shik Lee, Laura Carim-Todd,
Kathleen Mood, Tagvor G. Nishanian, Lino Tessarollo,
and Ira O. Daar
- 17311 **Crystal structure of human intrinsic factor: Cobalamin complex at 2.6-Å resolution**
F. S. Mathews, M. M. Gordon, Z. Chen, K. R. Rajashankar,
S. E. Ealick, D. H. Alpers, and N. Sukumar
- 17317 **GTPase acceleration as the rate-limiting step in *Arabidopsis* G protein-coupled sugar signaling**
Christopher A. Johnston, J. Philip Taylor, Yajun Gao,
Adam J. Kimple, Jeffrey C. Grigston, Jin-Gui Chen,
David P. Siderovski, Alan M. Jones, and Francis S. Willard
- 17323 **Modulators of the structural dynamics of the retinoid X receptor to reveal receptor function**
Virginie Nahoum, Efrén Pérez, Pierre Germain, Fátima Rodríguez-Barrios, Fabio Manzo, Sabrina Kammerer,
Geraldine Lemaire, Oliver Hirsch, Catherine A. Royer,
Hinrich Gronemeyer, Angel R. de Lera,
and William Bourguet
- 17329 **Identifying the subproteome of kinetically stable proteins via diagonal 2D SDS/PAGE**
Ke Xia, Marta Manning, Helai Hesham, Qishan Lin,
Christopher Bystroff, and Wilfredo Colón
- 17335 **Unraveling the hidden catalytic activity of vertebrate class IIa histone deacetylases**
 A. Lahm, C. Paolini, M. Pallaoro, M. C. Nardi, P. Jones,
P. Neddermann, S. Sambucini, M. J. Bottomley,
P. Lo Surdo, A. Carfi, U. Koch, R. De Francesco,
C. Steinkühler, and P. Gallinari
- 17341 **The prokaryotic Cys₂His₂ zinc-finger adopts a novel fold as revealed by the NMR structure of *Agrobacterium tumefaciens* Ros DNA-binding domain**
Gaetano Malgieri, Luigi Russo, Sabrina Esposito,
Ilaria Baglivo, Laura Zaccaro, Emilia M. Pedone,
Benedetto Di Blasio, Carla Isernia, Paolo V. Pedone,
and Roberto Fattorusso
- 17347 **Reevaluation of telomerase inhibition by quadruplex ligands and their mechanisms of action**
Anne De Cian, Gael Cristofari, Patrick Reichenbach, Elsa De Lemos, David Monchaud, Marie-Paule Teulade-Fichou,
Kazuo Shin-ya, Laurent Lacroix, Joachim Lingner,
and Jean-Louis Mergny
- 17353 **Identification of functional paralog shift mutations: Conversion of *Escherichia coli* malate dehydrogenase to a lactate dehydrogenase**
Yifeng Yin and Jack F. Kirsch
- 17358 **Leptin activates hypothalamic acetyl-CoA carboxylase to inhibit food intake**
 Su Gao, Kimberly P. Kinzig, Susan Aja, Karen A. Scott,
Wendy Keung, Sandra Kelly, Ken Strynadka, Shigeru Chohnan, Wanli W. Smith, Kellie L. K. Tamashiro,
Ellen E. Ladenheim, Gabriele V. Ronnett, Yajun Tu,
Morris J. Birnbaum, Gary D. Lopaschuk,
and Timothy H. Moran

BIOPHYSICS

- 17255 **Confocal light absorption and scattering spectroscopic microscopy monitors organelles in live cells with no exogenous labels**
 Irving Itzkan, Le Qiu, Hui Fang, Munir M. Zaman, Edward Vitkin, Ionita C. Ghiran, Saira Salahuddin, Mark Modell, Charlotte Andersson, Lauren M. Kimerer, Patsy B. Cipolloni, Kee-Hak Lim, Steven D. Freedman, Irving Bigio, Benjamin P. Sachs, Eugene B. Hanlon, and Lev T. Perelman
- 17261 **Picosecond fluctuating protein energy landscape mapped by pressure–temperature molecular dynamics simulation**
Lars Meinhold, Jeremy C. Smith, Akio Kitao, and Ahmed H. Zewail
- 17283 **Structural motifs of biomolecules**
Jayanth R. Banavar, Trinh Xuan Hoang, John H. Maddocks, Amos Maritan, Chiara Poletto, Andrzej Stasiak, and Antonio Trovato
- 17364 **Switchable DNA interfaces for the highly sensitive detection of label-free DNA targets**
Ulrich Rant, Kenji Arinaga, Simon Scherer, Erika Pringsheim, Shozo Fujita, Naoki Yokoyama, Marc Tornow, and Gerhard Abstreiter
- 17370 **Dynamic clustered distribution of hemagglutinin resolved at 40 nm in living cell membranes discriminates between raft theories**
 Samuel T. Hess, Travis J. Gould, Manasa V. Gudheti, Sarah A. Maas, Kevin D. Mills, and Joshua Zimmerberg
- 17376 **Analysis of nematode mechanics by piezoresistive displacement clamp**
 Sung-Jin Park, Miriam B. Goodman, and Beth L. Pruitt
- 17382 **Mechanical control of the directional stepping dynamics of the kinesin motor**
Changbong Hyeon and José N. Onuchic
- 17388 **Defined DNA sequences promote the assembly of a bacterial protein into distinct amyloid nanostructures**
Rafael Giraldo
- 17394 **Molecular imaging of membrane interfaces reveals mode of β -glucosidase activation by saposin C**
Jean-René Alattia, James E. Shaw, Christopher M. Yip, and Gilbert G. Privé
- 17400 **Probing polyproline structure and dynamics by photoinduced electron transfer provides evidence for deviations from a regular polyproline type II helix**
 Sören Doose, Hannes Neuweiler, Hannes Barsch, and Markus Sauer

CELL BIOLOGY


- 17406 **High-resolution imaging of the dynamic tumor cell–vascular interface in transparent zebrafish**
Konstantin Stoletov, Valerie Montel, Robin D. Lester, Steven L. Gonias, and Richard Klemke
- 17412 **An essential role for cortactin in the modulation of the potassium channel Kv1.2**
Michael R. Williams, Jonathan C. Markey, Megan A. Dozzi, and Anthony D. Morielli
- 17418 **The SCF^{Cdc4} ubiquitin ligase regulates calcineurin signaling through degradation of phosphorylated Rcn1, an inhibitor of calcineurin**
Tsutomu Kishi, Akemi Ikeda, Rina Nagao, and Noriko Koyama

- 17424 **Human G_{s α} mutant causes pseudohypoparathyroidism type Ia/neonatal diarrhea, a potential cell-specific role of the palmitoylation cycle**
Noriko Makita, Junichiro Sato, Philippe Rondard, Hiroshi Fukamachi, Yasuhito Yuasa, Micheala A. Aldred, Makiko Hashimoto, Toshiro Fujita, and Taroh Iiri

ECOLOGY

- 17430 **Drought mediates the importance of stochastic community assembly**
Jonathan M. Chase

EVOLUTION

- 17435 **Gossip as an alternative for direct observation in games of indirect reciprocity**
Ralf D. Sommerfeld, Hans-Jürgen Krambeck, Dirk Semmann, and Manfred Milinski
- 17441 **Variation in HIV-1 set-point viral load: Epidemiological analysis and an evolutionary hypothesis**
 Christophe Fraser, T. Déirdre Hollingsworth, Ruth Chapman, Frank de Wolf, and William P. Hanage


GENETICS

- 17447 **Loss-of-function mutation in the *prokineticin 2* gene causes Kallmann syndrome and normosmic idiopathic hypogonadotropic hypogonadism**
Nelly Pitteloud, Chengkang Zhang, Duarte Pignatelli, Jia-Da Li, Taneli Raivio, Lindsay W. Cole, Lacey Plummer, Elka E. Jacobson-Dickman, Pamela L. Mellon, Qun-Yong Zhou, and William F. Crowley, Jr.
→ See Commentary on page 17247

IMMUNOLOGY

- 17453 **HIV turns plasmacytoid dendritic cells (pDC) into TRAIL-expressing killer pDC and down-regulates HIV coreceptors by Toll-like receptor 7-induced IFN- α**
Andrew W. Hardy, David R. Graham, Gene M. Shearer, and Jean-Philippe Herbeval
- 17459 **The role of CD8⁺CD28⁻ regulatory cells in suppressing myasthenia gravis-associated responses by a dual altered peptide ligand**
Hava Ben-David, Amir Sharabi, Molly Dayan, Michael Sela, and Edna Mozes

MEDICAL SCIENCES

- 17465 **Real-time imaging of β -catenin dynamics in cells and living mice**
Snehal Naik and David Piwnicka-Worms
- 17471 **Blood group O protects against severe *Plasmodium falciparum* malaria through the mechanism of reduced rosetting**
 J. Alexandra Rowe, Ian G. Handel, Mahamadou A. Thera, Anne-Marie Deans, Kirsten E. Lyke, Abdoulaye Koné, Dapa A. Diallo, Ahmed Raza, Oscar Kai, Kevin Marsh, Christopher V. Plowe, Ogobara K. Doumbo, and Joann M. Moulds
- 17477 **Antibodies to CD4-induced sites in HIV gp120 correlate with the control of SHIV challenge in macaques vaccinated with subunit immunogens**
Anthony DeVico, Timothy Fouts, George K. Lewis, Robert C. Gallo, Karla Godfrey, Manhattan Charurat, Iliia Harris, Lindsey Galmin, and Ranajit Pal

17483 **Murine models of acute neuronopathic Gaucher disease**
 Ida Berglin Enquist, Christophe Lo Bianco, Andreas Ooka,
 Eva Nilsson, Jan-Eric Månsson, Mats Ehinger, Johan Richter,
 Roscoe O. Brady, Deniz Kirik, and Stefan Karlsson

17489 **Positron emission tomography (PET) imaging of neuroblastoma and melanoma with ⁶⁴Cu-SarAr immunoconjugates**
 Stephan D. Voss, Suzanne V. Smith, Nadine DiBartolo,
 Lacey J. McIntosh, Erika M. Cyr, Ali A. Bonab,
 Jason L. J. Dearling, Edward A. Carter, Alan J. Fischman,
 S. Ted Treves, Stephen D. Gillies, Alan M. Sargeson,
 James S. Huston, and Alan B. Packard

17494 **Identification of differentially expressed proteins in ovarian cancer using high-density protein microarrays**
 Michael E. Hudson, Irina Pozdnyakova, Kenneth Haines,
 Gil Mor, and Michael Snyder

17500 **Sulforaphane mobilizes cellular defenses that protect skin against damage by UV radiation**
 Paul Talalay, Jed W. Fahey, Zachary R. Healy,
 Scott L. Wehage, Andrea L. Benedict, Christine
 Min, and Alben T. Dinkova-Kostova

MICROBIOLOGY

17506 **Changes in viral protein function that accompany retroviral endogenization**
 Nidia M. Oliveira, Harshita Satija, I. Arlette Kouwenhoven,
 and Maribeth V. Eiden

17512 **Digital holographic microscopy reveals prey-induced changes in swimming behavior of predatory dinoflagellates**
 Jian Sheng, Edwin Malkiel, Joseph Katz, Jason Adolf,
 Robert Belas, and Allen R. Place

NEUROSCIENCE

17518 **Loss of Vac14, a regulator of the signaling lipid phosphatidylinositol 3,5-bisphosphate, results in neurodegeneration in mice**
 Yanling Zhang, Sergey N. Zolov, Clement Y. Chow,
 Shalom G. Slutsky, Simon C. Richardson, Robert C.
 Piper, Baoli Yang, Johnathan J. Nau, Randal J.
 Westrick, Sean J. Morrison, Miriam H. Meisler,
 and Lois S. Weisman

17524 **Loss of Bardet-Biedl syndrome proteins causes defects in peripheral sensory innervation and function**
 Perciliz L. Tan, Travis Barr, Peter N. Inglis, Norimasa
 Mitsuma, Susan M. Huang, Miguel A. Garcia-Gonzalez,
 Brian A. Bradley, Stephanie Coforio, Phillip J. Albrecht,
 Terry Watnick, Gregory G. Germino, Philip L. Beales,
 Michael J. Caterina, Michel R. Leroux, Frank L.
 Rice, and Nicholas Katsanis

17530 **Impaired hippocampal rhythmogenesis in a mouse model of mesial temporal lobe epilepsy**
 Tamar Dugladze, Imre Vida, Adriano B. Tort, Anna
 Gross, Jacob Otahal, Uwe Heinemann, Nancy J.
 Kopell, and Tengis Gloveli

17536 **Reduced cortical inhibition in a mouse model of familial childhood absence epilepsy**
 Heneu O. Tan, Christopher A. Reid, Frank N. Single,
 Philip J. Davies, Cindy Chiu, Susan Murphy, Alison L.
 Clarke, Leanne Dibbens, Heinz Krestel, John C.
 Mulley, Mathew V. Jones, Peter H. Seeburg,
 Bert Sakmann, Samuel F. Berkovic, Rolf
 Sprengel, and Steven Petrou

PHYSIOLOGY

17542 **Attenuation of store-operated Ca²⁺ current impairs salivary gland fluid secretion in TRPC1(−/−) mice**
 Xibao Liu, Kwong Tai Cheng, Bidhan C. Bandyopadhyay,
 Biswaranjan Pani, Alexander Dietrich, Biman C. Paria,
 William D. Swaim, David Beech, Eda Yildirim, Brij B.
 Singh, Lutz Birnbaumer, and Indu S. Ambudkar

PLANT BIOLOGY

17548 **Potential for hydrogen production with inducible chloroplast gene expression in *Chlamydomonas***
 Raymond Surzycki, Laurent Cournac, Gilles Peltier,
 and Jean-David Rochaix

CORRECTIONS

DEVELOPMENTAL BIOLOGY

17554 **The mouse homeobox gene *Noto* regulates node morphogenesis, notochord ciliogenesis, and left-right patterning**
 Anja Beckers, Leonie Alten, Christoph Viebahn, Philipp
 Andre, and Achim Gossler

MEDICAL SCIENCES

17554 **Combinatorial activities of Akt and B-Raf/Erk signaling in a mouse model of androgen-independent prostate cancer**

Hui Gao, Xuesong Ouyang, Whitney A. Banach-Petrosky,
 William L. Gerald, Michael M. Shen, and Cory Abate-Shen

17555 **Cyclophilin D inactivation protects axons in experimental autoimmune encephalomyelitis, an animal model of multiple sclerosis**

Michael Forte, Bruce G. Gold, Gail Marracci, Priya
 Chaudhary, Emy Basso, Dustin Johnsen, Xiaolin Yu,
 Jonathan Fowlkes, Paolo Bernardi, and Dennis Bourdette
 Michael Forte, Bruce G. Gold, Gail Marracci, Priya
 Chaudhary, Emy Basso, Dustin Johnsen, Xiaolin Yu,
 Jonathan Fowlkes, Micha Rahder, Katie Stem, Paolo
 Bernardi, and Dennis Bourdette

MICROBIOLOGY

17555 **Histone modifications induced by a family of bacterial toxins**

Mélanie Anne Hamon, Eric Batsché, Béatrice Régault,
 To Nam Tham, Stéphanie Seveau, Christian Muchardt,
 and Pascale Cossart

xi–xii Author Index

xiii Subscription Form