



**Cover image:** Pictured is a 3D reconstruction of a mouse cochlea subjected to a tissue clearing protocol to reveal the spiral ganglion with its afferent neurites innervating the inner hair cells of the sensory epithelium. Susann Michanski et al. used high-resolution imaging to characterize the structure of inner hair cell ribbon synapses at various developmental stages, from shortly before birth to adulthood. The results provide insights into the assembly and maturation of the structures, which enable synaptic sound encoding and hearing. See the article by Michanski et al. on pages 6415–6424. Image courtesy of Christian Vogl and Carlos Duque Afonso (University Medical Center Göttingen, Göttingen, Germany).

## From the Cover

- 6415 Auditory ribbon synapse maturation
- 6007 Silver and Phoenician westward expansion
- 6211 Prevalence of mixotrophy in oceans
- 6250 Selfish genetic elements for gene drive
- 6379 Brain insulin signaling and cognition

## Contents

### THIS WEEK IN PNAS

- 5833 In This Issue

### NEWS FEATURE—An in-depth look at trending science issues

- 5836 Interested in gauging a population's health? Look to sewage  
*John Carey*

### PROFILE

- 5840 Profile of Daniel A. Haber  
*Beth Azar*  
→ See Inaugural Article on page 5223 in issue 12 of volume 116

### COMMENTARIES

- 5843 Archaeological science brightens Mediterranean dark age  
*Erez Ben-Yosef*  
→ See companion article on page 6007
- 5846 Mixotroph ecology: More than the sum of its parts  
*Ben A. Ward*  
→ See companion article on page 6211
- 5849 Pest management by genetic addiction  
*Fred Gould, Sumit Dhole, and Alun L. Lloyd*  
→ See companion article on page 6250
- 5852 Unexpected systemic phenotypes result from focal combined deficiencies of forebrain insulin receptor/IGF-1 receptor signaling  
*Sam Gandy and Derek M. Huffman*  
→ See companion article on page 6379

### LETTERS

- 5855 On the Bayesian interpretation of the harmonic mean  $p$ -value  
*Leonhard Held*
- 5857 Reply to Held: When is a harmonic mean  $p$ -value a Bayes factor?  
*Daniel J. Wilson*
- 5859 cOAlition S: Response to PNAS  
*Robert Kiley and Robert-Jan Smits*

- 5861 **Reply to Kiley and Smits: Meeting Plan S's goal of maximizing access to research**  
Marcia McNutt

## INAUGURAL ARTICLE

- 5862 **The relationship between implicit intergroup attitudes and beliefs**  
Benedek Kurdi, Thomas C. Mann, Tessa E. S. Charlesworth, and Mahzarin R. Banaji

## PHYSICAL SCIENCES

### APPLIED MATHEMATICS

- 6473 **Dynamics of bed bug infestations and control under disclosure policies**  
Sherrie Xie, Alison L. Hill, Chris R. Rehmann, and Michael Z. Levy

### APPLIED PHYSICAL SCIENCES

- 5872 **Array atomic force microscopy for real-time multiparametric analysis**  
Qingqing Yang, Qian Ma, Kate M. Herum, Chonghe Wang, Nirav Patel, Joon Lee, Shanshan Wang, Tony M. Yen, Jun Wang, Hanmei Tang, Yu-Hwa Lo, Brian P. Head, Farooq Azam, Sheng Xu, Gert Cauwenberghs, Andrew D. McCulloch, Scott John, Zhaowei Liu, and Ratnesh Lal
- 5878 **Organic enantiomeric high- $T_c$  ferroelectrics**  
Peng-Fei Li, Wei-Qiang Liao, Yuan-Yuan Tang, Wencheng Qiao, Dewei Zhao, Yong Ai, Ye-Feng Yao, and Ren-Gen Xiong

### BIOPHYSICS AND COMPUTATIONAL BIOLOGY

- 5886 **Role of contacts in long-range protein conductance**  
Bintian Zhang, Weisi Song, Pei Pang, Huafang Lai, Qiang Chen, Peiming Zhang, and Stuart Lindsay
- 5892 **Cell-free gene-regulatory network engineering with synthetic transcription factors**  
Zoe Swank, Nadanai Laohakunakorn, and Sebastian J. Maerkl
- 5902 **Mechanisms for achieving high speed and efficiency in biomolecular machines**  
Jason A. Wagoner and Ken A. Dill
- 5908 **Biphasic mechanosensitivity of T cell receptor-mediated spreading of lymphocytes**  
Astrid Wahl, Céline Dinet, Pierre Dillard, Aya Nassereddine, Pierre-Henri Puech, Laurent Limozin, and Kheya Sengupta
- 5914 **Regulation of T cell expansion by antigen presentation dynamics**  
Andreas Mayer, Yaojun Zhang, Alan S. Perelson, and Ned S. Wingreen
- 5920 **Using a system's equilibrium behavior to reduce its energy dissipation in nonequilibrium processes**  
Sara Tafoya, Steven J. Large, Shixin Liu, Carlos Bustamante, and David A. Sivak

- 6140 **Spatiotemporal regulation of clonogenicity in colorectal cancer xenografts**  
Maartje van der Heijden, Daniël M. Miedema, Bartłomiej Waclaw, Veronique L. Veenstra, Maria C. Lecca, Lisanne E. Nijman, Erik van Dijk, Sanne M. van Neerven, Sophie C. Lodestijn, Kristiaan J. Lenos, Nina E. de Groot, Pramudita R. Prasetyanti, Andrea Arricibita Varea, Douglas J. Winton, Jan Paul Medema, Edward Morrissey, Bauke Ylstra, Martin A. Nowak, Maarten F. Bijlsma, and Louis Vermeulen

## CHEMISTRY

- 5925 **Spatially defined molecular emitters coupled to plasmonic nanoparticle arrays**  
Jianxi Liu, Weijia Wang, Danqing Wang, Jingtian Hu, Wendu Ding, Richard D. Schaller, George C. Schatz, and Teri W. Odom
- 5931 **Voltage-induced long-range coherent electron transfer through organic molecules**  
Karen Michaeli, David N. Beratan, David H. Waldeck, and Ron Naaman
- 5937 **Effects of microstructure formation on the stability of vapor-deposited glasses**  
Alex R. Moore, Georgia Huang, Sarah Wolf, Patrick J. Walsh, Zahra Fakhraei, and Robert A. Riggelman

## COMPUTER SCIENCES

- 5943 **Optimizing schools' start time and bus routes**  
Dimitris Bertsimas, Arthur Delarue, and Sebastien Martin
- 5949 **Online learning with an almost perfect expert**  
Simina Brânzei and Yuval Peres

## EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES

- 5955 **Antibiotic treatment affects the expression levels of copper transporters and the isotopic composition of copper in the colon of mice**  
Kerri A. Miller, Fernando A. Vicentini, Simon A. Hirota, Keith A. Sharkey, and Michael E. Wieser
- 5961 **Multiradionuclide evidence for an extreme solar proton event around 2,610 B.P. (~660 BC)**  
Paschal O'Hare, Florian Mekhaldi, Florian Adolphi, Grant Raisbeck, Ala Aldahan, Emma Anderberg, Jürg Beer, Marcus Christl, Simon Fahrni, Hans-Arno Synal, Junghun Park, Göran Possnert, John Southon, Edouard Bard, ASTER Team, and Raimund Muscheler
- 6007 **Lead isotopes in silver reveal earliest Phoenician quest for metals in the west Mediterranean**  
Tzilla Eshel, Yigal Erel, Naama Yahalom-Mack, Ofir Tirosh, and Ayelet Gilboa  
→ See Commentary on page 5843

## ENGINEERING

- 5967 **Stretchable materials of high toughness and low hysteresis**  
Zhengjin Wang (王正锦), Chunping Xiang, Xi Yao, Paul Le Floch, Julien Mendez, and Zhigang Suo
- 5973 **Light-triggered thermal conductivity switching in azobenzene polymers**  
Jungwoo Shin, Jaeuk Sung, Minjee Kang, Xu Xie, Byeongdu Lee, Kyung Min Lee, Timothy J. White, Cecilia Leal, Nancy R. Sottos, Paul V. Braun, and David G. Cahill
- 5979 **Multiplexed profiling of single-cell extracellular vesicles secretion**  
Yahui Ji, Dongyuan Qi, Linmei Li, Haoran Su, Xiaojie Li, Yong Luo, Bo Sun, Fuyin Zhang, Bingcheng Lin, Tingjiao Liu, and Yao Lu

## ENVIRONMENTAL SCIENCES

- 5985 **Predictable hydrological and ecological responses to Holocene North Atlantic variability**  
Bryan N. Shuman, Jeremiah Marsicek, W. Wyatt Oswald, and David R. Foster

## PHYSICS

- 5991 **Anomalous quantum criticality in the electron-doped cuprates**  
*P. R. Mandal, Tarapada Sarkar, and Richard L. Greene*

## STATISTICS

- 5995 **On a two-truths phenomenon in spectral graph clustering**  
*Carey E. Priebe, Youngser Park, Joshua T. Vogelstein, John M. Conroy, Vince Lyzinski, Minh Tang, Avanti Athreya, Joshua Cape, and Eric Bridgford*

## SUSTAINABILITY SCIENCE

- 6001 **Inequity in consumption of goods and services adds to racial-ethnic disparities in air pollution exposure**  
*Christopher W. Tessum, Joshua S. Apte, Andrew L. Goodkind, Nicholas Z. Muller, Kimberley A. Mullins, David A. Paolella, Stephen Polasky, Nathaniel P. Springer, Sumil K. Thakrar, Julian D. Marshall, and Jason D. Hill*

## SOCIAL SCIENCES

### ANTHROPOLOGY

- 6007 **Lead isotopes in silver reveal earliest Phoenician quest for metals in the west Mediterranean**  
*Tzila Eshel, Yigal Erel, Naama Yahalom-Mack, Ofir Tirosh, and Ayelet Gilboa*  
→ See Commentary on page 5843

### PSYCHOLOGICAL AND COGNITIVE SCIENCES

- 5862 **The relationship between implicit intergroup attitudes and beliefs**  
*Benedek Kurdi, Thomas C. Mann, Tessa E. S. Charlesworth, and Mahzarin R. Banaji*
- 6013 **Students of color show health advantages when they attend schools that emphasize the value of diversity**  
*Cynthia S. Levine, Hazel Rose Markus, Makeda K. Austin, Edith Chen, and Gregory E. Miller*
- 6019 **No effect of birth order on adult risk taking**  
*Tomás Lejarraga, Renato Frey, Daniel D. Schnitzlein, and Ralph Hertwig*
- 6025 **Toddlers and infants expect individuals to refrain from helping an ingroup victim's aggressor**  
*Fransisca Ting, Zijiang He, and Renée Baillargeon*
- 6035 **Model-free and model-based learning processes in the updating of explicit and implicit evaluations**  
*Benedek Kurdi, Samuel J. Gershman, and Mahzarin R. Banaji*
- 6482 **Regulation of arousal via online neurofeedback improves human performance in a demanding sensory-motor task**  
*Josef Faller, Jennifer Cummings, Sameer Saproo, and Paul Sajda*

### SOCIAL SCIENCES

- 5943 **Optimizing schools' start time and bus routes**  
*Dimitris Bertsimas, Arthur Delarue, and Sebastien Martin*
- 6045 **American geography of opportunity reveals European origins**  
*Thor Berger and Per Engzell*

## SUSTAINABILITY SCIENCE

- 6001 **Inequity in consumption of goods and services adds to racial-ethnic disparities in air pollution exposure**  
*Christopher W. Tessum, Joshua S. Apte, Andrew L. Goodkind, Nicholas Z. Muller, Kimberley A. Mullins, David A. Paolella, Stephen Polasky, Nathaniel P. Springer, Sumil K. Thakrar, Julian D. Marshall, and Jason D. Hill*

## BIOLOGICAL SCIENCES

### ANTHROPOLOGY

- 6051 **Primitive Old World monkey from the earliest Miocene of Kenya and the evolution of cercopithecoid bilophodonty**  
*D. Tab Rasmussen, Anthony R. Friscia, Mercedes Gutierrez, John Kappelman, Ellen R. Miller, Samuel Muteti, Dawn Reynoso, James B. Rossie, Terry L. Spell, Neil J. Tabor, Elizabeth Gierlowski-Kordesch, Bonnie F. Jacobs, Benson Kyongo, Mathew Macharwas, and Francis Muchemi*
- 6057 **Higher offspring mortality with short interbirth intervals in free-ranging rhesus macaques**  
*D. Susie Lee, Angelina V. Ruiz-Lambides, and James P. Higham*

### APPLIED BIOLOGICAL SCIENCES

- 5886 **Role of contacts in long-range protein conductance**  
*Bintian Zhang, Weisi Song, Pei Pang, Huafang Lai, Qiang Chen, Peiming Zhang, and Stuart Lindsay*
- 5955 **Antibiotic treatment affects the expression levels of copper transporters and the isotopic composition of copper in the colon of mice**  
*Kerri A. Miller, Fernando A. Vicentini, Simon A. Hirota, Keith A. Sharkey, and Michael E. Wieser*

### BIOCHEMISTRY

- 5892 **Cell-free gene-regulatory network engineering with synthetic transcription factors**  
*Zoe Swank, Nadanai Laohakunakorn, and Sebastian J. Maerkl*
- 6063 **Discovery of novel carbohydrate-active enzymes through the rational exploration of the protein sequences space**  
*William Helbert, Laurent Poulet, Sophie Drouillard, Sophie Mathieu, Mélanie Loiodice, Marie Couturier, Vincent Lombard, Nicolas Terrapon, Jeremy Turchetto, Renaud Vincentelli, and Bernard Henrissat*
- 6069 **Crystal structure of human mitochondrial trifunctional protein, a fatty acid  $\beta$ -oxidation metabolon**  
*Chuanwu Xia, Zhuji Fu, Kevin P. Battaile, and Jung-Ja P. Kim*
- 6075 **EZH1/2 function mostly within canonical PRC2 and exhibit proliferation-dependent redundancy that shapes mutational signatures in cancer**  
*Michel Wassef, Armelle Luscan, Setareh Aflaki, Dina Zielinski, Pascal W. T. C. Jansen, H. Irem Baymaz, Aude Battistella, Carole Kersouani, Nicolas Servant, Margaret R. Wallace, Pierre Romero, Olivier Kosmider, Pierre-Alexandre Just, Mikaël Hivelin, Sébastien Jacques, Anne Vincent-Salomon, Michiel Vermeulen, Michel Vidaud, Eric Pasmant, and Raphaël Margueron*
- 6081 **Global analysis of methionine oxidation provides a census of folding stabilities for the human proteome**  
*Ethan J. Walker, John Q. Bettinger, Kevin A. Welle, Jennifer R. Hryhorenko, and Sina Ghaemmaghami*

- 6091 **Regulatory control of Sgs1 and Dna2 during eukaryotic DNA end resection**  
Chaoyou Xue, Weibin Wang, J. Brooks Crickard, Corentin J. Moevus, Youngho Kwon, Patrick Sung, and Eric C. Greene
- 6101 **Human pregnancy zone protein stabilizes misfolded proteins including preeclampsia- and Alzheimer's-associated amyloid beta peptide**  
Jordan H. Cater, Janet R. Kumita, Rafaa Zeineddine Abdallah, Guomao Zhao, Ana Bernardo-Gancedo, Amanda Henry, Wendy Winata, Mengna Chi, Brin S. F. Grenyer, Michelle L. Townsend, Marie Ranson, Catalin S. Buhimschi, D. Stephen Charnock-Jones, Christopher M. Dobson, Mark R. Wilson, Irina A. Buhimschi, and Amy R. Wyatt
- 6111 **Mechanism for autoinhibition and activation of the MORC3 ATPase**  
Yi Zhang, Brianna J. Klein, Khan L. Cox, Bianca Bertulat, Adam H. Tencer, Michael R. Holden, Gregory M. Wright, Joshua Black, M. Cristina Cardoso, Michael G. Poirier, and Tatiana G. Kutateladze
- 6120 **Molecular basis of chromatin remodeling by Rhp26, a yeast CSB ortholog**  
Wei Wang, Jun Xu, Oliver Limbo, Jia Fei, George A. Kassavetis, Jenny Chong, James T. Kadonaga, Paul Russell, Bing Li, and Dong Wang
- 6130 **DNA-RNA triple helix formation can function as a cis-acting regulatory mechanism at the human  $\beta$ -globin locus**  
Zhuo Zhou, Keith E. Giles, and Gary Felsenfeld
- BIOPHYSICS AND COMPUTATIONAL BIOLOGY**
- 5872 **Array atomic force microscopy for real-time multiparametric analysis**  
Qingqing Yang, Qian Ma, Kate M. Herum, Chonghe Wang, Nirav Patel, Joon Lee, Shanshan Wang, Tony M. Yen, Jun Wang, Hanmei Tang, Yu-Hwa Lo, Brian P. Head, Farooq Azam, Sheng Xu, Gert Cauwenberghs, Andrew D. McCulloch, Scott John, Zhaowei Liu, and Ratnesh Lal
- CELL BIOLOGY**
- 6140 **Spatiotemporal regulation of clonogenicity in colorectal cancer xenografts**  
Maartje van der Heijden, Daniël M. Miedema, Bartłomiej Waclaw, Veronique L. Veenstra, Maria C. Lecca, Lisanne E. Nijman, Erik van Dijk, Sanne M. van Neerven, Sophie C. Lodestijn, Kristiaan J. Lenos, Nina E. de Groot, Pramudita R. Prasetyanti, Andrea Arricibita Varea, Douglas J. Winton, Jan Paul Medema, Edward Morrissey, Bauke Ylstra, Martin A. Nowak, Maarten F. Bijlsma, and Louis Vermeulen
- 6146 **Mitochondrial UPR repression during *Pseudomonas aeruginosa* infection requires the bZIP protein ZIP-3**  
Pan Deng, Nandhitha Uma Naresh, Yunguang Du, Lilian T. Lamech, Jun Yu, Lihua Julie Zhu, Read Pukkila-Worley, and Cole M. Haynes
- 6152 **Intracellular cargo transport by single-headed kinesin motors**  
Kristin I. Shimert, Breane G. Budaitis, Dana N. Reinemann, Matthew J. Lang, and Kristen J. Verhey
- 6162 **Injured liver-released miRNA-122 elicits acute pulmonary inflammation via activating alveolar macrophage TLR7 signaling pathway**  
Yanbo Wang, Hongwei Liang, Fangfang Jin, Xin Yan, Guifang Xu, Huanhuan Hu, Gaoli Liang, Shoubin Zhan, Xiuting Hu, Quan Zhao, Yuan Liu, Zhen-You Jiang, Chen-Yu Zhang, Xi Chen, and Ke Zen
- 6172 **RBFOX2-miR-34a-JPH2 axis contributes to cardiac decompensation during heart failure**  
Jing Hu, Chen Gao, Chaoliang Wei, Yuanchao Xue, Changwei Shao, Yajing Hao, Lan-Tao Gou, Yu Zhou, Jianlin Zhang, Shuxun Ren, Ju Chen, Yibin Wang, and Xiang-Dong Fu
- ECOLOGY**
- 5985 **Predictable hydrological and ecological responses to Holocene North Atlantic variability**  
Bryan N. Shuman, Jeremiah Marsicek, W. Wyatt Oswald, and David R. Foster
- 6181 **Saving endangered species using adaptive management**  
Robert Serrouya, Dale R. Seip, Dave Hervieux, Bruce N. McLellan, R. Scott McNay, Robin Steenweg, Doug C. Heard, Mark Hebblewhite, Michael Gillingham, and Stan Boutin
- 6187 **Diversifying livestock promotes multidiversity and multifunctionality in managed grasslands**  
Ling Wang, Manuel Delgado-Baquerizo, Deli Wang, Forest Isbell, Jun Liu, Chao Feng, Jushan Liu, Zhiwei Zhong, Hui Zhu, Xia Yuan, Qing Chang, and Chen Liu
- 6193 **Wildfires and climate change push low-elevation forests across a critical climate threshold for tree regeneration**  
Kimberley T. Davis, Solomon Z. Dobrowski, Philip E. Higuera, Zachary A. Holden, Thomas T. Veblen, Monica T. Rother, Sean A. Parks, Anna Sala, and Marco P. Maneta
- 6199 **Earlier phenology of a nonnative plant increases impacts on native competitors**  
Jake M. Alexander and Jonathan M. Levine
- 6205 **Applying modern coexistence theory to priority effects**  
Tess Nahanni Grainger, Andrew D. Letten, Benjamin Gilbert, and Tadashi Fukami
- 6211 **Mixotrophy in nanoflagellates across environmental gradients in the ocean**  
Kyle F. Edwards  
→ See Commentary on page 5846
- ENVIRONMENTAL SCIENCES**
- 6221 **Incentivizing hospital infection control**  
Sarah E. Drohan, Simon A. Levin, Bryan T. Grenfell, and Ramanan Laxminarayan
- EVOLUTION**
- 5902 **Mechanisms for achieving high speed and efficiency in biomolecular machines**  
Jason A. Wagoner and Ken A. Dill
- 6226 **Genomic plasticity associated with antimicrobial resistance in *Vibrio cholerae***  
Jyoti Verma, Satyabrata Bag, Bipasa Saha, Pawan Kumar, Tarini Shankar Ghosh, Mayanka Dayal, Tarosi Senapati, Seema Mehra, Prasanta Dey, Anbumani Desigamani, Dhirendra Kumar, Preeti Rana, Bhoj Kumar, Tushar K. Maiti, Naresh C. Sharma, Rupak K. Bhadra, Ankur Mutreja, G. Balakrish Nair, Thandavarayan Ramamurthy, and Bhabatosh Das
- 6232 **Genomes of skipper butterflies reveal extensive convergence of wing patterns**  
Wenlin Li, Qian Cong, Jinhui Shen, Jing Zhang, Winnie Hallwachs, Daniel H. Janzen, and Nick V. Grishin
- 6238 **Polyandrous bee provides extended offspring care biparentally as an alternative to monandry based eusociality**  
Michael Mikát, Lukáš Janošík, Kateřina Černá, Eva Matoušková, Jiří Hadrava, Vít Bureš, and Jakub Straka



6244 **Fractional coalescent**  
Somayeh Mashayekhi and Peter Beerli

#### GENETICS

6250 **Cleave and Rescue, a novel selfish genetic element and general strategy for gene drive**  
Georg Oberhofer, Tobin Ivy, and Bruce A. Hay  
→ See Commentary on page 5849

6260 **Interplay between DNA sequence and negative superhelicity drives R-loop structures**  
Robert Stolz, Shaheen Sulthana, Stella R. Hartono, Maika Malig, Craig J. Benham, and Frederic Chedin

6270 **Point centromere activity requires an optimal level of centromeric noncoding RNA**  
Yick Hin Ling and Karen Wing Yee Yuen

#### IMMUNOLOGY AND INFLAMMATION

5908 **Biphasic mechanosensitivity of T cell receptor-mediated spreading of lymphocytes**  
Astrid Wahl, Céline Dinet, Pierre Dillard, Aya Nassereddine, Pierre-Henri Puech, Laurent Limozin, and Kheya Sengupta

6280 **P-selectin drives complement attack on endothelium during intravascular hemolysis in TLR-4/heme-dependent manner**  
Nicolas S. Merle, Romain Paule, Juliette Leon, Marie Daugan, Tania Robe-Rybikine, Victoria Poillerat, Carine Torset, Véronique Frémeaux-Bacchi, Jordan D. Dimitrov, and Lubka T. Roumenina

6286 **Transcriptional factor ATF3 protects against colitis by regulating follicular helper T cells in Peyer's patches**  
Yingjiao Cao, Qiong Yang, Hui Deng, Jinyi Tang, Jiancong Hu, Huanliang Liu, Min Zhi, Linsen Ye, Bin Zou, Yongdong Liu, Lai Wei, Dmitry I. Gabrilovich, Haikun Wang, and Jie Zhou

6292 **Aspirin-triggered proresolving mediators stimulate resolution in cancer**  
Molly M. Gilligan, Allison Gartung, Megan L. Sulciner, Paul C. Norris, Vikas P. Sukhatme, Diane R. Bielenberg, Sui Huang, Mark W. Kieran, Charles N. Serhan, and Dipak Panigrahy

6298 **Microenvironment tailors nTreg structure and function**  
Valérie Schiavon, Sophie Duchez, Mylène Branchtein, Alexandre How-Kit, Charles Cassius, Antoine Daunay, Yimin Shen, Sylvie Dubanchet, Renaud Colisson, Valérie Vanneaux, Alain Pruvost, Camille Roucaïrol, Niclas Setterblad, Jean-David Bouaziz, Marie-Christophe Boissier, Luca Semerano, Carlos Graux, Armand Bensussan, Arsène Burny, Robert Gallo, Daniel Zagury, and Hélène Le Buanec

#### MEDICAL SCIENCES

6308 **Detection of early-stage hepatocellular carcinoma in asymptomatic HBsAg-seropositive individuals by liquid biopsy**  
Chunfeng Qu, Yuting Wang, Pei Wang, Kun Chen, Minjie Wang, Hongmei Zeng, Jianquan Lu, Qianqian Song, Bill H. Diplas, Da Tan, Chunsun Fan, Qigao Guo, Zheng Zhu, Huihui Yin, Liping Jiang, Xixi Chen, Hui Zhao, Huan He, Yong Wang, Guangyu Li, Xinyu Bi, Xinming Zhao, Taoyang Chen, Hongping Tang, Chuanguo Lv, Dongmei Wang, Wanqing Chen, Jianguo Zhou, Hong Zhao, Jianqiang Cai, Xiaoyue Wang, Sizhen Wang, Hai Yan, Yi-Xin Zeng, Webster K. Cavenee, and Yuchen Jiao

6313 **Taurine transporter (TauT) deficiency impairs ammonia detoxification in mouse liver**  
Natalia Qvartskhava, Cheng Jun Jin, Tobias Buschmann, Ute Albrecht, Johannes Georg Bode, Niloufar Monhasery, Jessica Oenarto, Hans Jürgen Bidmon, Boris Görg, and Dieter Häussinger

6319 **Lipoprotein lipase is active as a monomer**  
Anne P. Beigneux, Christopher M. Allan, Norma P. Sandoval, Geoffrey W. Cho, Patrick J. Heizer, Rachel S. Jung, Kimber L. Stanhope, Peter J. Havel, Gabriel Birrane, Muthuraman Meiyappan, John E. Gill IV, Masami Murakami, Kazuya Miyashita, Katsuyuki Nakajima, Michael Ploug, Loren G. Fong, and Stephen G. Young

#### MICROBIOLOGY

6329 **Energy conservation by a hydrogenase-dependent chemiosmotic mechanism in an ancient metabolic pathway**  
Marie Charlotte Schoelmerich and Volker Müller

6335 **Cyclic-di-GMP regulation promotes survival of a slow-replicating subpopulation of intracellular *Salmonella Typhimurium***  
Erik Petersen, Erez Mills, and Samuel I. Miller

6341 **Uropathogenic *Escherichia coli* employs both evasion and resistance to subvert innate immune-mediated zinc toxicity for dissemination**  
Claudia J. Stocks, Minh-Duy Phan, Maud E. S. Achard, Nguyen Thi Khanh Nhu, Nicholas D. Condon, Jayde A. Gawthorne, Alvin W. Lo, Kate M. Peters, Alastair G. McEwan, Ronan Kapetanovic, Mark A. Schembri, and Matthew J. Sweet

6351 ***Leishmania* flagellum attachment zone is critical for flagellar pocket shape, development in the sand fly, and pathogenicity in the host**  
Jack D. Sunter, Ryuji Yanase, Ziyin Wang, Carolina Moura Costa Catta-Preta, Flavia Moreira-Leite, Jitka Myskova, Katerina Pruzinova, Petr Volf, Jeremy C. Mottram, and Keith Gull

6361 **Divergent kinase regulates membrane ultrastructure of the *Toxoplasma parasitophorous* vacuole**  
Tsebaot Beraki, Xiaoyu Hu, Malgorzata Broncel, Joanna C. Young, William J. O'Shaughnessy, Dominika Borek, Moritz Treeck, and Michael L. Reese

6371 **Immunitization of Vγ2Vδ2 T cells programs sustained effector memory responses that control tuberculosis in nonhuman primates**  
Ling Shen, James Frencher, Dan Huang, Wandang Wang, Enzhuo Yang, Crystal Y. Chen, Zhuoran Zhang, Richard Wang, Arwa Qaqish, Michelle H. Larsen, Hongbo Shen, Steven A. Porcelli, William R. Jacobs Jr., and Zheng W. Chen

#### NEUROSCIENCE

6379 **Insulin signaling in the hippocampus and amygdala regulates metabolism and neurobehavior**  
Marion Soto, Weikang Cai, Masahiro Konishi, and C. Ronald Kahn  
→ See Commentary on page 5852

6385 **GSAP modulates  $\gamma$ -secretase specificity by inducing conformational change in PS1**  
Eitan Wong, George P. Liao, Jerry C. Chang, Peng Xu, Yue-Ming Li, and Paul Greengard

6391 **Interhemispheric plasticity is mediated by maximal potentiation of callosal inputs**  
Emily Petrus, Galit Saar, Zhiwei Ma, Steve Dodd, John T. R. Isaac, and Alan P. Koretsky

6397 **Cholecystokinin release triggered by NMDA receptors produces LTP and sound-sound associative memory**  
Xi Chen, Xiao Li, Yin Ting Wong, Xuejiao Zheng, Haitao Wang, Yujie Peng, Hemin Feng, Jingyu Feng, Joewel T. Baibado, Robert Jesky, Zhedi Wang, Hui Xie, Wenjian Sun, Zicong Zhang, Xu Zhang, Ling He, Nan Zhang, Zhijian Zhang, Peng Tang, Junfeng Su, Ling-Li Hu, Qing Liu, Xiaobin He, Ailian Tan, Xia Sun, Min Li, Kelvin Wong, Xiaoyu Wang, Hon-Yeung Cheung, Daisy Kwok-Yan Shum, Ken K. L. Yung, Ying-Shing Chan, Micky Tortorella, Yiping Guo, Fuqiang Xu, and Jufang He

6407 **Evidence for the incorporation of temporal duration information in human hippocampal long-term memory sequence representations**  
Sathesan Thavabalasingam, Edward B. O'Neil, Jonathan Tay, Adrian Nestor, and Andy C. H. Lee

6415 **Mapping developmental maturation of inner hair cell ribbon synapses in the apical mouse cochlea**  
Susann Michanski, Katharina Smaluch, Anna Maria Steyer, Rituparna Chakrabarti, Cristian Setz, David Oestreicher, Christian Fischer, Wiebke Möbius, Tobias Moser, Christian Vogl, and Carolin Wichmann

6425 **Estimating average single-neuron visual receptive field sizes by fMRI**  
Georgios A. Keliris, Qinglin Li, Amalia Papanikolaou, Nikos K. Logothetis, and Stelios M. Smirnakis

#### PHARMACOLOGY

6435 **A cell type-selective apoptosis-inducing small molecule for the treatment of brain cancer**  
Natasha C. Lucki, Genaro R. Villa, Naja Vergani, Michael J. Bollong, Brittney A. Beyer, Jae Wook Lee, Justin L. Anglin, Stephan H. Spangenberg, Emily N. Chin, Amandeep Sharma, Kevin Johnson, Philipp N. Sander, Perry Gordon, Stephen L. Skirboll, Heiko Wurdak, Peter G. Schultz, Paul S. Mischel, and Luke L. Lairson

6441 **(2R,6R)-hydroxynorketamine exerts mGlu<sub>2</sub> receptor-dependent antidepressant actions**  
Panos Zanos, Jaclyn N. Highland, Brent W. Stewart, Polymnia Georgiou, Carleigh E. Jenne, Jacqueline Lovett, Patrick J. Morris, Craig J. Thomas, Ruin Moaddel, Carlos A. Zarate Jr., and Todd D. Gould

#### PLANT BIOLOGY

6451 **Processing bodies control the selective translation for optimal development of Arabidopsis young seedlings**  
Geng-Jen Jang, Jun-Yi Yang, Hsu-Liang Hsieh, and Shu-Hsing Wu

6457 **Interplay between differentially expressed enzymes contributes to light color acclimation in marine *Synechococcus***  
Joseph E. Sanfilippo, Adam A. Nguyen, Laurence Garczarek, Jonathan A. Karty, Suman Pokhrel, Johann A. Strnat, Frédéric Partensky, Wendy M. Schluchter, and David M. Kehoe

6463 **Selective auxin agonists induce specific AUX/IAA protein degradation to modulate plant development**  
Thomas Vain, Sara Raggi, Noel Ferro, Deepak Kumar Barange, Martin Kieffer, Qian Ma, Samsa M. Doyle, Mattias Thelander, Barbora Pařízková, Ondřej Novák, Alexandre Ismail, Per-Anders Enquist, Adeline Rigal, Małgorzata Łangowska, Sigurd Ramans Harborough, Yi Zhang, Karin Ljung, Judy Callis, Fredrik Almqvist, Stefan Kepinski, Mark Estelle, Laurens Pauwels, and Stéphanie Robert

#### POPULATION BIOLOGY

6473 **Dynamics of bed bug infestations and control under disclosure policies**  
Sherrie Xie, Alison L. Hill, Chris R. Rehmman, and Michael Z. Levy

#### PSYCHOLOGICAL AND COGNITIVE SCIENCES

6482 **Regulation of arousal via online neurofeedback improves human performance in a demanding sensory-motor task**  
Josef Faller, Jennifer Cummings, Sameer Saproo, and Paul Sajda

#### SUSTAINABILITY SCIENCE

6181 **Saving endangered species using adaptive management**  
Robert Serrouya, Dale R. Seip, Dave Hervieux, Bruce N. McLellan, R. Scott McNay, Robin Steenweg, Doug C. Heard, Mark Hebblewhite, Michael Gillingham, and Stan Boutin

6187 **Diversifying livestock promotes multidiversity and multifunctionality in managed grasslands**  
Ling Wang, Manuel Delgado-Baquerizo, Deli Wang, Forest Isbell, Jun Liu, Chao Feng, Jushan Liu, Zhiwei Zhong, Hui Zhu, Xia Yuan, Qing Chang, and Chen Liu

#### SYSTEMS BIOLOGY

6491 **Predictability of human differential gene expression**  
Megan Crow, Nathaniel Lim, Sara Ballouz, Paul Pavlidis, and Jesse Gillis

### CORRECTIONS

#### IMMUNOLOGY AND INFLAMMATION

6501 **CCN1/CYR61-mediated meticulous patrolling by Ly6C<sup>low</sup> monocytes fuels vascular inflammation**  
Beat A. Imhof, Stephane Jemelin, Romain Ballet, Christian Vesin, Marco Schapira, Melis Karaca, and Yalin Emre

#### NEUROSCIENCE, BIOPHYSICS AND COMPUTATIONAL BIOLOGY

6502 **Descending pathway facilitates undulatory wave propagation in *Caenorhabditis elegans* through gap junctions**  
Tianqi Xu, Jing Huo, Shuai Shao, Michelle Po, Taizo Kawano, Yangning Lu, Min Wu, Mei Zhen, and Quan Wen

#### NEUROSCIENCE

6503 **Altered neural odometry in the vertical dimension**  
Giulio Casali, Daniel Bush, and Kate Jeffery

#### PHARMACOLOGY

6505 **Therapeutic targeting of HER2–CB2R heteromers in HER2-positive breast cancer**  
Sandra Blasco-Benito, Estefanía Moreno, Marta Seijo-Vila, Isabel Tundidor, Clara Andradás, María M. Caffarel, Miriam Caro-Villalobos, Leyre Urigüen, Rebeca Diez-Alarcia, Gema Moreno-Bueno, Lucía Hernández, Luis Manso, Patricia Homar-Ruano, Peter J. McCormick, Lucka Bibic, Cristina Bernadó-Morales, Joaquín Arribas, Meritxell Canals, Vicent Casadó, Enric I. Canela, Manuel Guzmán, Eduardo Pérez-Gómez, and Cristina Sánchez