

Table of Contents

This issue and full Instructions to Authors are
available in electronic form at
<http://www.mcponline.org>

Special Issue

Introduction

- 1523 **Proteomics Propels Protein Degradation Studies in San Diego**
Eric J. Bennett and Thibault Mayor

Review

- 1529 **Characterizing Ubiquitination Sites by Peptide-based Immunoaffinity Enrichment**
Daisy Bustos, Corey E. Bakalarski, Yanling Yang, Junmin Peng, and Donald S. Kirkpatrick
- 1541 **Understanding Cullin-RING E3 Biology through Proteomics-based Substrate Identification**
J. Wade Harper and Meng-Kwang Marcus Tan

Perspective

- 1551 **Proteome Dynamics: Revisiting Turnover with a Global Perspective**
Amy J. Claydon and Robert Beynon

Research

- 1566 **Mapping the Structural Topology of the Yeast 19S Proteasomal Regulatory Particle Using Chemical Cross-linking and Probabilistic Modeling**
[S] *Athit Kao, Arlo Randall, Yingying Yang, Vishal R. Patel, Wynne Kandur, Shenheng Guan, Scott D. Rychnovsky, Pierre Baldi, and Lan Huang*
- 1578 **Proteomic Analyses Reveal Divergent Ubiquitylation Site Patterns in Murine Tissues**
[S] ✎ *Sebastian A. Wagner, Petra Beli, Brian T. Weinert, Christian Schölz, Christian D. Kelstrup, Clifford Young, Michael L. Nielsen, Jesper V. Olsen, Cord Brakebusch, and Chunaram Choudhary*
- 1586 **Metabolic Labeling Reveals Proteome Dynamics of Mouse Mitochondria**
[S] *Tae-Young Kim, Ding Wang, Allen K. Kim, Edward Lau, Amanda J. Lin, David A. Liem, Jun Zhang, Nobel C. Zong, Maggie P. Y. Lam, and Peipei Ping*

On the cover: Proteasome Bashe Dragons Devouring and Digesting Ubiquitinated Substrates. Painting by Julie Newdoll, www.brushwithscience.com. In the cytosol (the ocean region in the painting) certain protein "fish" have been tagged for degradation by a seaweed-like chain of ubiquitin wrapped around their tails. One such fish is being shuttled towards the proteasome "dragon" by a fish-tailed sea god, while others are drifting towards destruction on their own. After digestion, the protein "fish" can be seen expelled from the other end of the dragon as bones. In Chinese mythology, Bashe Dragons are said to eat elephants and excrete their bones years later. In the nucleus, the bright orange land of the underworld in the painting, the black silhouette of a second proteasome dragon can be seen involved in the same task. This dragon is similar, but not the same, as the one in the cytosol in ways that are not yet understood.

- 1595 **Recognition and Cleavage of Related to Ubiquitin 1 (Rub1) and Rub1-Ubiquitin Chains by Components of the Ubiquitin-Proteasome System**
Rajesh K. Singh, Sylvia Zerath, Oded Kleifeld, Martin Scheffner, Michael H. Glickman, and David Fushman

Regular Issue

Review

- 1612 **File Formats Commonly Used in Mass Spectrometry Proteomics**
Eric W. Deutsch
- 1622 **Single-cell-type Proteomics: Toward a Holistic Understanding of Plant Function**
Shaojun Dai and Sixue Chen

Research

- 1631 **Phosphoproteome of *Pristionchus pacificus* Provides Insights into Architecture of Signaling Networks in Nematode Models**
Nadine Borchert, Karsten Krug, Florian Gnad, Amit Sinha, Ralf J. Sommer, and Boris Macek
- 1640 **Investigation of Receptor interacting protein 3 (RIP3)-dependent Protein Phosphorylation by Quantitative Phosphoproteomics**
Xiurong Wu, Lili Tian, Jie Li, Yingying Zhang, Victor Han, Yuanyue Li, Xiaozheng Xu, Hanjie Li, Xi Chen, Jinan Chen, Wenhai Jin, Yongming Xie, Jiahuai Han, and Chuan-Qi Zhong
- 1652 **Flexible Survival Strategies of *Pseudomonas aeruginosa* in Biofilms Result in Increased Fitness Compared with *Candida albicans***
Frauke Gina Purschke, Ekkehard Hiller, Iris Trick, and Steffen Rupp
- 1670 **Biochemical Fractionation and Stable Isotope Dilution Liquid Chromatography-mass Spectrometry for Targeted and Microdomain-specific Protein Quantification in Human Postmortem Brain Tissue**
Matthew L. MacDonald, Eugene Ciccimaro, Amol Prakash, Anamika Banerjee, Steven H. Seeholzer, Ian A. Blair, and Chang-Gyu Hahn
- 1690 **Functional Proteomic Analysis of Long-term Growth Factor Stimulation and Receptor Tyrosine Kinase Coactivation in Swiss 3T3 Fibroblasts**
Kohji Nagano, Akunna Akpan, Gayathri Warnasuriya, Steven Corless, Nick Totty, Alice Yang, Robert Stein, Marketa Zvelebil, Allan Stensballe, Al Burlingame, Michael Waterfield, Rainer Cramer, John F. Timms, and Søren Naaby-Hansen
- 1724 **Molecular Characterization of EGFR and EGFRvIII Signaling Networks in Human Glioblastoma Tumor Xenografts**
Hannah Johnson, Amanda M. Del Rosario, Bryan D. Bryson, Mark A. Schroeder, Jann N. Sarkaria, and Forest M. White
- 1741 **Temporal Profiling of Lapatinib-suppressed Phosphorylation Signals in EGFR/HER2 Pathways**
Koshi Imami, Naoyuki Sugiyama, Haruna Imamura, Masaki Wakabayashi, Masaru Tomita, Masatoshi Taniguchi, Takayuki Ueno, Masakazu Toi, and Yasushi Ishihama
- 1768 **Mass Spectrometry Reveals Differences in Stability and Subunit Interactions between Activated and Nonactivated Conformers of the $(\alpha\beta\gamma\delta)_4$ Phosphorylase Kinase Complex**
Laura A. Lane, Owen W. Nadeau, Gerald M. Carlson, and Carol V. Robinson

- 1777 **Adipose triglyceride lipase (ATGL) and Hormone-sensitive lipase (HSL) Deficiencies Affect Expression of Lipolytic Activities in Mouse Adipose Tissues**
 [S] *Maria Morak, Hannes Schmidinger, Gernot Riesenhuber, Gerald N. Rechberger, Manfred Kollroser, Guenter Haemmerle, Rudolf Zechner, Florian Kronenberg, and Albin Hermetter*
- 1801 **The Effect of Long Term Calorie Restriction on *in Vivo* Hepatic Proteostasis: A Novel Combination of Dynamic and Quantitative Proteomics**
 ✂ *John C. Price, Cyrus F. Khambatta, Kelvin W. Li, Matthew D. Bruss, Mahalakshmi Shankaran, Marcy Dalidd, Nicholas A. Floreani, Lindsay S. Roberts, Scott M. Turner, William E. Holmes, and Marc K. Hellerstein*
- 1815 **Human Family with Sequence Similarity 60 Member A (FAM60A) Protein: a New Subunit of the Sin3 Deacetylase Complex**
 [S] *Karen T. Smith, Mihaela E. Sardu, Skylar A. Martin-Brown, Chris Seidel, Arcady Mushegian, Rhonda Egidy, Laurence Florens, Michael P. Washburn, and Jerry L. Workman*
- 1829 **Targeted Proteomics of the Secretory Pathway Reveals the Secretome of Mouse Embryonic Fibroblasts and Human Embryonic Stem Cells**
 [S] *Prasenjit Sarkar, Shan M. Randall, David C. Muddiman, and Balaji M. Rao*
- 1840 **Intermembrane Space Proteome of Yeast Mitochondria**
 [S] ✂ *F.-Nora Vögtle, Julia M. Burkhart, Sanjana Rao, Carolin Gerbeth, Jens Hinrichs, Jean-Claude Martinou, Agnieszka Chacinska, Albert Sickmann, René P. Zahedi, and Chris Meisinger*
- 1853 **Quantitative Proteomic Analysis Reveals that Antioxidation Mechanisms Contribute to Cold Tolerance in Plantain (*Musa paradisiaca* L.; ABB Group) Seedlings**
 [S] *Qiao-Song Yang, Jun-Hua Wu, Chun-Yu Li, Yue-Rong Wei, Ou Sheng, Chun-Hua Hu, Rui-Bin Kuang, Yong-Hong Huang, Xin-Xiang Peng, James A. McCardle, Wei Chen, Yong Yang, Jocelyn K. C. Rose, Sheng Zhang, and Gan-Jun Yi*
- 1870 **Identification of Differentially Expressed Proteins in Direct Expressed Prostatic Secretions of Men with Organ-confined Versus Extracapsular Prostate Cancer**
 [S] *Yunee Kim, Vladimir Ignatchenko, Cindy Q. Yao, Irina Kalatskaya, Julius O. Nyalwidhe, Raymond S. Lance, Anthony O. Gramolini, Dean A. Troyer, Lincoln D. Stein, Paul C. Boutros, Jeffrey A. Medin, O. John Semmes, Richard R. Drake, and Thomas Kislinger*
- 1885 **Identification of New Autoantigens by Protein Array Indicates a Role for IL4 Neutralization in Autoimmune Hepatitis**
 [S] *Chiara Zingaretti, Milena Arigò, Angela Cardaci, Monica Moro, Mariacristina Crosti, Antonella Sinisi, Elisa Sugliano, Cristina Cheroni, Francesco Marabita, Renzo Nogarotto, Raoul Jean Pierre Bonnal, Paolo Marcatili, Maurizio Marconi, Annalinda Zignego, Paolo Muratori, Pietro Invernizzi, Piero Colombatto, Maurizia Brunetto, Ferruccio Bonino, Raffaele De Francesco, Jens Geginat, Massimiliano Pagani, Luigi Muratori, Sergio Abrignani, and Mauro Bombaci*
- 1898 **Linker for Activation of T-cell Family Member2 (LAT2) a Lipid Raft Adaptor Protein for AKT Signaling, Is an Early Mediator of Alkylphospholipid Anti-leukemic Activity**
 [S] *Carolina H. Thomé, Guilherme A. dos Santos, Germano A. Ferreira, Priscila S. Scheucher, Clarice Izumi, Andreia M. Leopoldino, Ana Maria Simão, Pietro Ciancaglini, Kleber T. de Oliveira, Alice Chin, Samir M. Hanash, Roberto P. Falcão, Eduardo M. Rego, Lewis J. Greene, and Vitor M. Faça*
- 1913 **Structural and Quantitative Evidence for Dynamic Glycome Shift on Production of Induced Pluripotent Stem Cells**
 [S] *Kayo Hasehira, Hiroaki Tateno, Yasuko Onuma, Yuzuru Ito, Makoto Asashima, and Jun Hirabayashi*
- 1924 **Mass Spectrometry-based Proteomic Analysis of the Matrix Microenvironment in Pluripotent Stem Cell Culture**
 [S] *Chris Hughes, Lida Radan, Wing Y. Chang, William L. Stanford, Dean H. Betts, Lynne-Marie Postovit, and Gilles A. Lajoie*

- 1937
[S] **Analysis of SRC Oncogenic Signaling in Colorectal Cancer by Stable Isotope Labeling with Heavy Amino Acids in Mouse Xenografts**
Audrey Sirvent, Oana Vigy, Beatrice Orsetti, Serge Urbach, and Serge Roche
- 1951
[S] **High-definition De Novo Sequencing of Crustacean Hyperglycemic Hormone (CHH)-family Neuropeptides**
Chenxi Jia, Limei Hui, Weifeng Cao, Christopher B. Lietz, Xiaoyue Jiang, Ruibing Chen, Adam D. Catherman, Paul M. Thomas, Ying Ge, Neil L. Kelleher, and Lingjun Li
- 1965
[S] * **Dynamics of Ribosomal Protein S1 on a Bacterial Ribosome with Cross-Linking and Mass Spectrometry**
Matthew A. Lauber, Juri Rappsilber, and James P. Reilly

Technological Innovation and Resources

- 1682
[S] * **The PRoteomics IDentification (PRIDE) Converter 2 Framework: An Improved Suite of Tools to Facilitate Data Submission to the PRIDE Database and the ProteomeXchange Consortium**
Richard G. Côté, Johannes Griss, José A. Dianes, Rui Wang, James C. Wright, Henk W.P. van den Toorn, Bas van Breukelen, Albert J. R. Heck, Niels Hulstaert, Lennart Martens, Florian Reisinger, Attila Csordas, David Ovelleiro, Yasset Perez-Rivevol, Harald Barsnes, Henning Hermjakob, and Juan Antonio Vizcaíno
- 1709
[S] **Targeted Proteomic Quantification on Quadrupole-Orbitrap Mass Spectrometer**
Sebastien Gallien, Elodie Duriez, Catharina Crone, Markus Kellmann, Thomas Moehring, and Bruno Doman
- 1758
[S] **Analysis of Intact Monoclonal Antibody IgG1 by Electron Transfer Dissociation Orbitrap FTMS**
Luca Fornelli, Eugen Damoc, Paul M. Thomas, Neil L. Kelleher, Konstantin Aizikov, Eduard Denisov, Alexander Makarov, and Yury O. Tsybin
- 1790
[S] **High-resolution Mapping of Linear Antibody Epitopes Using Ultrahigh-density Peptide Microarrays**
Søren Buus, Johan Rockberg, Björn Forsström, Peter Nilsson, Mathias Uhlen, and Claus Schafer-Nielsen

AUTHOR INDEX

- Abrignani, Sergio, 1885
Aizikov, Konstantin, 1758
Akpan, Akunna, 1690
Arigò, Milena, 1885
Asashima, Makoto, 1913
- Bakalarski, Corey E., 1529
Baldi, Pierre, 1566
Banerjee, Anamika, 1670
Barsnes, Harald, 1682
Beli, Petra, 1578
Bennett, Eric J., 1523
Betts, Dean H., 1924
Beynon, Robert, 1551
Blair, Ian A., 1670
Bombaci, Mauro, 1885
Bonino, Ferruccio, 1885
Bonnal, Raoul Jean Pierre, 1885
Borchert, Nadine, 1631
Boutros, Paul C., 1870
Brakebusch, Cord, 1578
Brunetto, Maurizia, 1885
Bruss, Matthew D., 1801
Bryson, Bryan D., 1724
Burkhart, Julia M., 1840
Burlingame, Al, 1690
Bustos, Daisy, 1529
Buus, Søren, 1790
- Cao, Weifeng, 1951
Cardaci, Angela, 1885
Carlson, Gerald M., 1768
Catherman, Adam D., 1951
Chacinska, Agnieszka, 1840
Chang, Wing Y., 1924
Chen, Jinan, 1640
Chen, Ruibing, 1951
Chen, Sixue, 1622
Chen, Wei, 1853
Chen, Xi, 1640
Cheroni, Cristina, 1885
Chin, Alice, 1898
Choudhary, Chunaram, 1578
Ciancaglini, Pietro, 1898
Ciccimaro, Eugene, 1670
Claydon, Amy J., 1551
Colombatto, Piero, 1885
Corless, Steven, 1690
Côté, Richard G., 1682
Cramer, Rainer, 1690
Crone, Catharina, 1709
Crosti, Mariacristina, 1885
Csordas, Attila, 1682
- Dai, Shaojun, 1622
Dalidd, Marcy, 1801
Damoc, Eugen, 1758
De Francesco, Raffaele, 1885
de Oliveira, Kleber T., 1898
Del Rosario, Amanda M., 1724
Denisov, Eduard, 1758
Deutsch, Eric W., 1612
Dianes, José A., 1682
Domon, Bruno, 1709
dos Santos, Guilherme A., 1898
Drake, Richard R., 1870
Duriez, Elodie, 1709
- Egidy, Rhonda, 1815
- Faça, Vitor M., 1898
Falcão, Roberto P., 1898
Ferreira, Germano A., 1898
Floreani, Nicholas A., 1801
Florens, Laurence, 1815
Fornelli, Luca, 1758
Forsström, Björn, 1790
Fushman, David, 1595
- Gallien, Sebastien, 1709
Geginat, Jens, 1885
Gerbeth, Carolin, 1840
Ge, Ying, 1951
Glickman, Michael H., 1595
Gnad, Florian, 1631
Gramolini, Anthony O., 1870
Greene, Lewis J., 1898
Griss, Johannes, 1682
Guan, Shenheng, 1566
- Haemmerle, Guenter, 1777
Hahn, Chang-Gyu, 1670
Hanash, Samir M., 1898
Han, Jiahuai, 1640
Han, Victor, 1640
Harper, J. Wade, 1541
Hasehira, Kayo, 1913
Heck, Albert J. R., 1682
Hellerstein, Marc K., 1801
Hermetter, Albin, 1777
Hermjakob, Henning, 1682
Hiller, Ekkehard, 1652
Hinrichs, Jens, 1840
Hirabayashi, Jun, 1913
Holmes, William E., 1801
Huang, Lan, 1566
Huang, Yong-Hong, 1853
Hughes, Chris, 1924
Hui, Limei, 1951

Hulstaert, Niels, 1682
 Hu, Chun-Hua, 1853

Ignatchenko, Vladimir, 1870
 Imami, Koshi, 1741
 Imamura, Haruna, 1741
 Invernizzi, Pietro, 1885
 Ishihama, Yasushi, 1741
 Ito, Yuzuru, 1913
 Izumi, Clarice, 1898

Jiang, Xiaoyue, 1951
 Jia, Chenxi, 1951
 Jin, Wenhai, 1640
 Johnson, Hannah, 1724

Kalatskaya, Irina, 1870
 Kandur, Wynne, 1566
 Kao, Athit, 1566
 Kelleher, Neil L., 1758 ,1951
 Kellmann, Markus, 1709
 Kelstrup, Christian D., 1578
 Khambatta, Cyrus F., 1801
 Kim, Allen K., 1586
 Kim, Tae-Young, 1586
 Kim, Yunee, 1870
 Kirkpatrick, Donald S., 1529
 Kislinger, Thomas, 1870
 Kleifeld, Oded, 1595
 Kollroser, Manfred, 1777
 Kronenberg, Florian, 1777
 Krug, Karsten, 1631
 Kuang, Rui-Bin, 1853

Lajoie, Gilles A., 1924
 Lam, Maggie P. Y., 1586
 Lance, Raymond S., 1870
 Lane, Laura A., 1768
 Lauber, Matthew A., 1965
 Lau, Edward, 1586
 Leopoldino, Andreia M., 1898
 Liem, David A., 1586
 Lietz, Christopher B., 1951
 Lin, Amanda J., 1586
 Li, Chun-Yu, 1853
 Li, Hanjie, 1640
 Li, Jie, 1640
 Li, Kelvin W., 1801
 Li, Lingjun, 1951
 Li, Yuanyue, 1640

MacDonald, Matthew L., 1670
 Macek, Boris, 1631
 Makarov, Alexander, 1758
 Marabita, Francesco, 1885
 Marcatili, Paolo, 1885
 Marconi, Maurizio, 1885

Martens, Lennart, 1682
 Martin-Brown, Skylar A., 1815
 Martinou, Jean-Claude, 1840
 Mayor, Thibault, 1523
 McCardle, James A., 1853
 Medin, Jeffrey A., 1870
 Meisinger, Chris, 1840
 Moehring, Thomas, 1709
 Morak, Maria, 1777
 Moro, Monica, 1885
 Muddiman, David C., 1829
 Muratori, Luigi, 1885
 Muratori, Paolo, 1885
 Mushegian, Arcady, 1815

Naaby-Hansen, Søren, 1690
 Nadeau, Owen W., 1768
 Nagano, Kohji, 1690
 Nielsen, Michael L., 1578
 Nilsson, Peter, 1790
 Nogarotto, Renzo, 1885
 Nyalwidhe, Julius O., 1870

Olsen, Jesper V., 1578
 Onuma, Yasuko, 1913
 Orsetti, Beatrice, 1937
 Ovelleiro, David, 1682

Pagani, Massimiliano, 1885
 Patel, Vishal R., 1566
 Peng, Junmin, 1529
 Peng, Xin-Xiang, 1853
 Perez-Rivevol, Yasset, 1682
 Ping, Peipei, 1586
 Postovit, Lynne-Marie, 1924
 Prakash, Amol, 1670
 Price, John C., 1801
 Purschke, Frauke Gina, 1652

Radan, Lida, 1924
 Randall, Arlo, 1566
 Randall, Shan M., 1829
 Rao, Balaji M., 1829
 Rao, Sanjana, 1840
 Rappsilber, Juri, 1965
 Rechberger, Gerald N., 1777
 Rego, Eduardo M., 1898
 Reilly, James P., 1965
 Reisinger, Florian, 1682
 Riesenhuber, Gernot, 1777
 Roberts, Lindsay S., 1801
 Robinson, Carol V., 1768
 Rockberg, Johan, 1790
 Rose, Jocelyn K. C., 1853
 Rupp, Steffen, 1652
 Rychnovsky, Scott D., 1566

Sardu, Mihaela E., 1815
 Sarkaria, Jann N., 1724
 Sarkar, Prasenjit, 1829
 Schölz, Christian, 1578
 Schafer-Nielsen, Claus, 1790
 Scheffner, Martin, 1595
 Scheucher, Priscila S., 1898
 Schmidinger, Hannes, 1777
 Schroeder, Mark A., 1724
 Seeholzer, Steven H., 1670
 Seidel, Chris, 1815
 Semmes, O. John, 1870
 Serge Roche, 1937
 Shankaran, Mahalakshmi, 1801
 Sheng, Ou, 1853
 Sickmann, Albert, 1840
 Simão, Ana Maria, 1898
 Singh, Rajesh K., 1595
 Sinha, Amit, 1631
 Sinisi, Antonella, 1885
 Sirvent, Audrey, 1937
 Smith, Karen T., 1815
 Sommer, Ralf J., 1631
 Stanford, William L., 1924
 Stein, Lincoln D., 1870
 Stein, Robert, 1690
 Stensballe, Allan, 1690
 Sugiyama, Naoyuki, 1741
 Sugliano, Elisa, 1885

 Taniguchi, Masatoshi, 1741
 Tan, Meng-Kwang Marcus, 1541
 Tateno, Hiroaki, 1913
 Thomé, Carolina H., 1898
 Thomas, Paul M., 1758 , 1951
 Tian, Lili, 1640
 Timms, John F., 1690
 Toi, Masakazu, 1741
 Tomita, Masaru, 1741
 Totty, Nick, 1690
 Trick, Iris, 1652
 Troyer, Dean A., 1870
 Tsybin, Yury O., 1758
 Turner, Scott M., 1801

 Ueno, Takayuki, 1741
 Uhlen, Mathias, 1790

 Urbach, Serge, 1937

 Vögtle, F.-Nora, 1840
 van Breukelen, Bas, 1682
 van den Toorn, Henk W.P., 1682
 Vigy, Oana, 1937
 Vizcaíno, Juan Antonio, 1682

 Wagner, Sebastian A., 1578
 Wakabayashi, Masaki, 1741
 Wang, Ding, 1586
 Wang, Rui, 1682
 Warnasuriya, Gayathri, 1690
 Washburn, Michael P., 1815
 Waterfield, Michael, 1690
 Weinert, Brian T., 1578
 Wei, Yue-Rong, 1853
 White, Forest M., 1724
 Workman, Jerry L., 1815
 Wright, James C., 1682
 Wu, Jun-Hua, 1853
 Wu, Xiurong, 1640

 Xie, Yongming, 1640
 Xu, Xiaozheng, 1640

 Yang, Alice, 1690
 Yang, Qiao-Song, 1853
 Yang, Yanling, 1529
 Yang, Yingying, 1566
 Yang, Yong, 1853
 Yao, Cindy Q., 1870
 Yi, Gan-Jun, 1853
 Young, Clifford, 1578

 Zahedi, René P., 1840
 Zechner, Rudolf, 1777
 Zerath, Sylvia, 1595
 Zhang, Jun, 1586
 Zhang, Sheng, 1853
 Zhang, Yingying, 1640
 Zhong, Chuan-Qi, 1640
 Zignego, Annalinda, 1885
 Zingaretti, Chiara, 1885
 Zong, Nobel C., 1586
 Zvelebil, Marketa, 1690