

CURRICULUM VITAE

Hoi-Ying N. Holman, PhD

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Director, Berkeley Synchrotron Infrared Structural Biology Program

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Advanced Light Source (ALS) BioSciences Council

Climate and Ecosystem Sciences Division

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Lawrence Berkeley National Laboratory

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EDUCATION

- 1988 Postdoctoral Fellow, University of California Toxic Substances Research & Training Program,
- 1986 Ph.D. Environmental Chemistry & Chemical Engineering, University of California, Berkeley, CA

PROFESSIONAL APPOINTMENTS

- 2015 - present Senior Scientist; Lawrence Berkeley National Laboratory
- 2010 - present Director of Berkeley Synchrotron Infrared Structural Biology Program at the Advanced Light Source, Lawrence Berkeley National Laboratory
- 2008 - present Head, Chemical Ecology; Lawrence Berkeley National Laboratory
- 1995 - present Principal Investigator; Staff Scientist/Chemist, Center for Environmental Biotechnology, Earth Sciences Division, Lawrence Berkeley National Laboratory
- 1990 - 1994 Staff Scientist/Chemist; Head/Director, Environmental Measurements Laboratory; Group Leader of Analytical Organic Chemistry, Lawrence Berkeley National Laboratory
- 1989 - 1990 Scientist/Chemist, Earth Sciences Division, Lawrence Berkeley National Laboratory

HONORS

- 2014 2014 R&D 100 Awards "Multiplex Chemotyping Microarray"
- 2010 David A. Shirley Award for Outstanding Scientific Achievement which recognizes her "*pioneering the study of living cells and their response to environmental stimuli using synchrotron-based FTIR (Fourier Transform Infrared) spectromicroscopy*", and her "*SR-FTIR imaging for Gulf Oil Spill research*".
- 2005 Lawrence Berkeley National Laboratory Technology Transfer Award
- 1998 Lawrence Berkeley National Laboratory Outstanding Scientific Performance Award

PATENTS ISSUED AND PATENTS PENDING

- Holman HYH, Louthback K, Liang Chen (2015) Device for Spectroscopic Imaging of Live Cells (IB 2015-77)

- Holman HYN, O'Brien, JT, Williams E (2014) Ambient infrared Laser Ablation with Continuous Flow Probe for Mass Spectrometry and Integration with infrared imaging. IB #2014-084
- Holman HYN, Birarda G, Probst A (2014) rapid and label-free procedure for microbial community screening and profiling (MCSP). IB-2014-015.
- Holman HYN, Choi S, Chen L, Birarda G (2013) Multiplex chemotyping microarray (MCM) system and methods. IB-2013-073-02.
- Holman, HYN. (2013). Spectroscopic evaluation of atherosclerotic plaques, U.S. Patent No. 857, 1640;
- Holman, HYN. (2000), Gastrointestinal mimetic device U.S. Patent No. 6,040,188.

PEER REVIEWED PUBLICATIONS (10 YEARS)

- 1) Birarda G, Ravasio A, Suryana M, Maniam S, Holman H-YN, Greci G (2016) IR-Live: fabrication of a low-cost plastic microfluidic device for infrared spectromicroscopy of living cells. *Lab on a Chip*, . *Lab on a Chip*, 16, 1644-1651.
- 2) Loutharback K, Birarda G, Chen L, Holman HYN (2016) Microfluidic approaches to synchrotron radiation-based Fourier transform infrared (SR-FTIR) spectral microscopy of living Biosystems. *Protein & Peptide Letters*, 23(3), 273-282.
- 3) Bouskill N, Wood TE, Baran R, Hao Z, Ye Z, Bowen BP, Lim HC, Nico P, Holman H-Y, Gilbert B, Silver W, Northen TR, Brodie EL (2016) Below ground response to drought in a tropical forest soil. II. Change in microbial function impacts carbon composition. *Frontiers in Microbiology*, 7(323), 1-14.
- 4) Smith-Moritz AM, Hao Z, Fernández-Niño SG, Fangel JU, Verherbruggen Y, Holman HYN, Willats WGT, Ronald PC, Scheller H, Heazlewood JL, Vega-Sanchez M (2015) Structural characterization of a mixed-linkage glucan deficient mutant reveals alteration in cellulose microfibril orientation in rice coleoptile mesophyll cell walls. *Frontiers in Plant Science*, 6(628), 1-13.
- 5) Cohen MF, Gurung S, Birarda G, Holman HYN, Yamasaki H (2015) Bimodal effect of hydrogen peroxide and oxidative events in nitrite-induced rapid root abscission by the water fern *Azolla pinnata*. *Frontier in Plant Science*. 6, 628: 1-13.
- 6) Cohen M, Hu P, Nguyen MV, Kamennaya N, Brown N, Woyke T, Kyrpides N, Holman HYN, Torok T (2015) Genome sequence of the alkaline-tolerant *Cellulomonas* sp. strain FA1. *Genome Announcements*, AMS.
- 7) Loutharback K, Chen L, Holman HYN (2015) An open-channel microfluidic membrane device for long-term FTIR spectromicroscopy of live adherent cells. *Analytical Chemistry*, 87(9) 4601-4606.
- 8) Kamanaya NA, Ahn SE, Park H, Bartal R, Sasaki KA, Holman HYN, Jansson C (2015) Installing extra bicarbonate transporters in the cyanobacterium *Synechocystis* sp. PCC6803 enhances biomass production. *Metabolic Engineering*, 29, 76-85.
- 9) Luef B, Frischkorn KR, Wrighton KC, Holman HYN, Birarda G, Thomas BC, Singh A, Williams KH, Siegerist CE, Tringe SG, Downing KH, Comolli LR, and Banfield JF (2015). Diverse uncultivated ultra-small bacterial cells in groundwater. *Nature Communications*, 6, 6372-6380.
- 10) O'Brien TJ, Williams ER, and Holman HYN (2015). Ambient Infrared Laser Ablation Mass Spectrometry (AIRLAB-MS) of Live Plant Tissue with Plume Capture by Continuous Flow Solvent Probe. *Analytical Chemistry*, 87 (5), 2631-2638.
- 11) Holman, H.-Y.N., Chen, Liang. Non-destructive molecular mapping and imaging: Synchrotron FTIR spectral microscopy, in "Imaging Life", Howard G., Brown W., Auer M (edts), Oxford University Press, Inc. USA. 2014.
- 12) Probst AJ, Birarda B, Holman HYN, DeSantis TZ, Wanner G, Andersen GL, Alexandra KP, Meck S, Völkel J, Bechtel HA, Wirth R, Moissl-Eichinger C (2014) Coupling genetic and chemical microbiome profiling

- reveals heterogeneity of Archaeome and Bacterome in subsurface biofilms that are dominated by the same Archaeal species. *Plos One*, 9(6) e99801.
- 13) Birarda G, Holman EA, Fu S, Weikel K, Hu P, Blankenberg FG, Holman HYN, Taylor A (2013) Synchrotron infrared imaging of advanced glycation endproducts (AGEs) in cardiac tissue from mice fed high glycemic diets. *Biomedical Spectroscopy and Imaging* 4: 301-315.
 - 14) Hu, P., Borglin, S., Kamennaya, N.A., Chen, L., Park, H., Mahoney, L., Kijac, A., Shan, G., Chavarría, K.L., Zhang, C., Quinn, N.W.T., Wemmer D., Holman, H.-Y.N., Jansson, C.. Metabolic phenotyping of the cyanobacterium *Synechocystis* 6803 engineered for production of alkanes and free fatty acids. *Applied Energy*, 102: 850-859, 2013.
 - 15) Probst, A.J., Holman, H.-Y.N., DeSantis, T.Z., Andersen, G.L., Bechtel, H.A., Sonnleitner, M., Venkateswaran, K. and Moissl-Eichinger C. Trackling the minority: sulfate-reducing bacteria in an archaea-dominated subsurface biofilm, *ISEM*; 7(3): 635-651, 2013.
 - 16) Mason, O.U., Hazen, T.C., Borglin, S., Chain, P.S.G., Dubinsky, E.A., Fortney J.L., Han J., Holman, H.-Y.N., Hultman, J., Lamendella, R., Mackelprang, R., Malfatti, S., Tom, L.M., Tringe, S.G., Woyke, T., Zhou, J., Rubin, E.M., Jansson, J.K. Metagenome, metatranscriptome and single cell genomics reveal functional response of active Oceanospirillales to the Gulf of Mexico oil spill. *ISEM*, 6, 1715-1727, 2012.
 - 17) Bælum, J., Borglin, S., Chakraborty, R., Fortney, J.L., Lamendella, R., Mason, O.U., Auer, M., Zemla, M., Bill, M., Conrad, M.E., Malfatti, S.A., Tringe, S.G., Holman, H.-Y.N., T.C. Hazen, and Jansson, J.K. Deep-sea bacteria enriched by oil and dispersant from the Deepwater Horizon spill. *Environmental Microbiology*, 14(9), 2405-2416, 2012.
 - 18) Chen, L., Holman, H.-Y.N., Hao, Z., Bechtel H.A., Martin M.C., Wu C., and Chu Steven. Synchrotron infrared measurements of protein phosphorylation in living single PC12 cells during neuronal differentiation. *Analytical Chemistry*, 84: 4118-4125, 2012, and in *Chemical & Engineering News*, 2012.
 - 19) Choi S., Park I., Hao Z., Holman H.-Y.N., Pisano, A.P. Quantitative studies of long-term stable, top-down Fabricated Silicon Nanowire pH Sensors. *Appl Phys A*, 107(2), 421-428, 2012.
 - 20) Cheng, YG, Holman, H.-Y.N., Lin, Z. Remediation of chromium and uranium contamination by microbial activity. *Elements*, 8(2), 107-112, 2012.
 - 21) Holman, H.-Y.N. and F. G. Blankenbery. Mid-Infrared reflectivity of mouse atheromas: a case study, in *Biomedical Applications of Synchrotron Infrared Microspectroscopy: A Practical Approach*(RSC Analytical Spectroscopy Series), Royal Society of Chemistry, 351-366, 2011.
 - 22) Tsibakhashvili, N.Y., Kalabegishvili, T.L., Rcheulishvili, A.N., Gintury, E.N., Lomidze, L.G., Gvarjaladze, Rcheulishvili, O.A., H.-Y.N. Holman. Effect of Zn (II) on the reduction and accumulation of Cr(VI) by *Arthrobacter* species. *J. Ind. Microbiol. Biotechnol.* 38(12), 1803-1808, 2011.
 - 23) Holman, H.-Y. N., Bechtel, H.A., Hao, Z., and M.C. Martin. Synchrotron IR spectromicroscopy: chemistry of living cells. *Analytical Chemistry* (Cover feature article), 82(21), 8757-8765, November 1, 2010; *Chemical & Engineering News*, 2011.
 - 24) Hoi-Ying N. Holman, Zhao Hao, Michael C. Martin, Hans A. Bechtel, Infrared spectromicroscopy: probing live cellular responses to environmental changes, *Synchrotron Radiation News*, 23, 12, 2010.
 - 25) Hazen, T.C., Dubinsky, E. A., DeSantis, T.Z., Andersen, G.L., Piceno, Y. M., Singh, N., Jansson, J.R., Probst, A., Borglin, S.E., Fortney, J.L., Stringfellow, W.T., Bill, M., Conrad, M.S., Tom, L.M., Chavarria, K.L., Alusi, T.R., Lamendella, R., Joyner, D.C., Spier, C., Auer, M., Zemla, M.L., Chakraborty, R., Sonnenthal, E.L., D'haeseleer, P., Holman, H.-Y. N., Osman, S., Lu, Z., Van Nostrand, J.D., Deng, Y., Zhou, J., and Mason, O.U. Deep-sea oil plume enriches psychrophilic oil-degrading bacteria, *Science*, 330(6001), 204-208, 2010.

- 26) Holman, H.-Y.N. Synchrotron infrared spectromicroscopy for studying chemistry of microbial activity in geologic materials, in *Synchrotron-Based Techniques in Soils and Sediments*, (Editors: B. Singh and M. Gräfe), Developments in Soil Science, Vol. 34, 103-130, Elsevier, 2010.
- 27) Lacayo, C.I., Malkin, A.J., Holman, H.-Y. N., Chen, L., Ding, S.-Y., Hwang, M.S., and M.P. Thelen. Imaging cell wall architecture in single *Zinnia elegans* tracheary elements, *Plant Physiology*, 154, 121-133, 2010.
- 28) Asatiani, N., Abuladze, M., Kartvelishvili, T., Kulikova, N., Asanishvili, L., Holman, H.-Y.N., and N. Sapojnikova. Response of antioxidant defense system to chromium(III)-induced cytotoxicity in human diploid cells, *Biometals*, 23:161-172, 2010.
- 29) Choi, S., Park, I., Hao, Z., Holman, H.-Y.N., Pisano, A., and T. Zohdi. Ultra-fast self-assembly of micro-scale particles by open-channel flow. *Langmuir*, 26(7):, 4661-4667, 2009.
- 30) Holman, H.-Y.N., Miles, R., Hao, Z., Wozel, E., Anderson, L.M., and H. Yang. Real-time chemical imaging of bacterial activity in biofilms using open-channel microfluidics and synchrotron FTIR spectromicroscopy. *Analytical Chemistry*, 81(20), 8564-8570, 2009.
- 31) Holman, H.-Y.N., Wozel, E., Lin, Z., Comolli, L.R., Ball, D.A., Borglin, S., Field M.W., Hazen, T.C. and K.H. Downing. Real-time molecular monitoring of chemical environment in obligate anaerobes during oxygen adaptive response. *PNAS USA*, 106(31), 12599-12640, 2009.
- 32) Tsibakhashvili, N., Kalabegishvili, T., Rchenlishvili A. V., Murusidze, I., Rchenlishvili O.A., Kerkenjia, S., Holman, H.-Y. N. Decomposition of Cr(VI)-diols to Cr(III) complexes *A. oxydans*. *Microbial Ecology*, 57:360-366, 2009.
- 33) Holman, H.-Y.N. Bjornstad, C., Rosenberg, C., Martin, M.C., McKinney, W.R., Blakely E.A., and F.G. Blankenberg, Mid-infrared reflectivity of experimental atheromas. *J. of Biomedical Optics*, 13, 2008.
- 34) Tsibakhashvili, N., Kalabegishvili, T., Mosulishvili, L., Kirkesali, E., Kerkenjia, S., Murusidze, I., Holman, H.-Y. N., Frontasyeva, M.V., and S.F. Gundorina. Biotechnology of Cr(VI) transformation into Cr(III) complexes. *J. of Radioanalytical and Nuclear Chemistry*, 278(3), 2008.
- 35) Yang, C., Cheng, Y., Ma, X., Zhu, Y., Holman, H.-Y.N., Zhang, L., and C. Wang. Surface mediated chromate-resistant mechanism of *Enterobacter cloacae* bacteria investigated by atomic force microscopy. *Langmuir*, 23(8), 4480-4485, 2007.
- 36) Holman, H.-Y. N., and M.C. Martin. Synchrotron radiation infrared spectromicroscopy: a non-invasive molecular probe for biogeochemical processes. *Advances in Agronomy*, 90: 79-127, 2006.
- 37) R. Codd, P. Lay, N. Tsibakhashvili, T. Kalabegishvili, I. Murusidze, H.-Y. N. Holman. Chromium(VI) complexes generated in *Arthrobacter oxydans* by simulation analysis of EPR spectra. *J. Inorg. Biochem.* 100, 1827-1833, 2006.
- 38) Lin, Z., Zhu, Y., Kalabegishvili T.L., Tsibakhashvili, N.Y., and H.-Y. N. Holman. Effect of chromate action on morphology of basalt-inhabiting bacteria. *Materials Science and Engineering C*. 26:610-612, 2006.
- 39) Woods, K.N., Lee, S.A., Holman, H.-Y. N., and J. Wiedemann. "The effect of solvent dynamics on the low frequency collective motions of DNA in solution and unoriented films", *J. Chemical Physics*, 124:224706-1 – 224706-8, 2006.
- 40) Mukhopadhyay, A., He Z., Alm E.J., Arkin A.P., Baidoo E.E., Borglin S.C., Chen W., Hazen T.C., He Q., Holman H.-Y. N., Huang K., Huang R., Joyner D.C., Katz N., Keller M., Oeller P., Redding A., Sun J., Wall J., Wei1 J., Yen H.-C., Zhou J., and J. D. Keasling. Salt stress in *Desulfovibrio vulgaris* Hildenborough: An integrated genomics approach. *J. of Bacteriology*, 188(11): 4068-4018, 2006.
- 41) Tsibakhashvili, N.Y., Frontasyeva M.V., Kirkesali E.I., Aksenova N.G., Kalabegishvili, T.L., Murusidze I.G., Mosulishvili, L.M., H.-Y. N. Holman. Epithelial neutron activation analysis of Cr(VI)-reducer basalt-inhabiting bacteria. *Analytical Chemistry*, 78(18), 6285-6290, 2006.
- 42) Kalabegishvili, T.L., Tsibakhashvili, N.Y., Murusidze, G., Pataraya, D.T., Gurielidze, M.A., and H.-Y.N. Holman. Formation of Cr(VI) and Cr(III) in *Arthrobacter oxydans* exposed to high concentrations of Cr(VI).

- in *Modern Multidisciplinary Applied Microbiology: Exploiting Microbes and Their Interactions*, A. Mendez-Vilas (edt.), 516-520, Wiley Online Library.
- 43) Wozei, E., Hermanowicz S. W., and H.-Y. N. Holman. Developing a biosensor for estrogens in water samples: Study of the real-time response of live cells of the estrogen-sensitive yeast strain RMY/ER-ERE using fluorescence microscopy. *Biosensors & Bioelectronics*. 21(8): 1654-1658, 2006.
 - 44) Wozei, E., Holman H.-Y.N., Hermanowicz, S.W. and S. Borglin. Detecting estrogenic activity in water samples with estrogen-sensitive yeast cells using spectrophotometry and fluorescence microscopy. *In: 2006 Symposium - Safe Drinking Water: Where Science Meets Policy*, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, U.S.A., March 16-17, 2006. LBNL-59880.
 - 45) Monaselidze, J., Abuladze M., Asatiani N., Kiziria E., Barbakadze S., Majagaladze G., Iobadze M., Tabatadze L., Holman H.-Y. N., and N. Sapojnikova. Characterization of chromium-induced apoptosis in cultured mammalian cells: A differential scanning calorimetry study. *Thermochimica Acta*. 441:8-15, 2006.
 - 46) Stroo H.F., Nakles D.V., Kreitinger J. P., Lohehr R.C., Hawthorn, S.B., Luthy, R.G., Holman H.-Y. N., and A. Lapierre. Improving risk assessments for manufactured gas plant soils by measuring PAH availability. *Integrated Environmental Assessment and Management*. 1(3): 259–266, 2005.