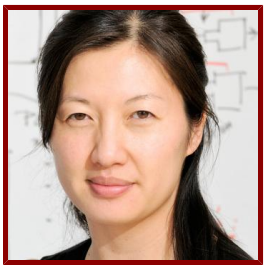
Stanford



Alice Ting

Professor of Genetics, of Biology and, by courtesy, of Chemistry

Bio

ACADEMIC APPOINTMENTS

- Professor, Genetics
- Professor, Biology
- Professor (By courtesy), Chemistry
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Stanford Cancer Institute
- Faculty Fellow, Stanford ChEM-H
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Professor of Genetics, Biology, and by courtesy, Chemistry, Stanford University, (2016- present)
- Professor of Chemistry, MIT, (2014-2016)
- Associate Professor of Chemistry, MIT, (2007-2014)
- Assistant Professor of Chemistry, MIT, (2002-2007)

HONORS AND AWARDS

- Bruce Merrifield Distinguished Lecture, Rockefeller (2020)
- NIH Director’s Transformative Research Award, NIH (2018)
- Chan Zuckerberg Biohub Investigator, Chan Zuckerberg Biohub (2017)
- Arthur C. Cope Scholar Award, American Chemical Society (2010)
- NIH Director’s Pioneer Award, NIH (2008)
- McKnight Technological Innovations in Neuroscience Award, McKnight Foundation (2005)
- HHMI Collaborative Innovation Award, HHMI (2012)
- NIH Director’s Transformative Research Award, NIH (2013)
- Alexander M. Cruickshank Award Lecture, . (2018)
- Prize for Creative Promise in Biomedical Science, Vilcek Foundation (2012)
- Ellen Swallow Richards Chair, MIT (2011)
- Eli Lilly Award in Biological Chemistry, American Chemical Society (2010)

- E. Bright Wilson Prize Lecture, Harvard University (2008)
- Buck-Whitney Award, American Chemical Society (2007)
- Camille Dreyfus Teacher-Scholar Award, Dreyfus Foundation (2006)
- Technology Review TR35 Award, MIT (2006)
- Alfred P. Sloan Foundation Research Fellowship, Sloan Foundation (2005)
- EJLB Foundation Scholar Research Program Award, EJLB Foundation (2003)
- NIH K22 Career Development Award, NIH (2003)
- Young Investigator Award, Office of Naval Research (2003)
- Camille and Henry Dreyfus New Faculty Award, Dreyfus Foundation (2002)
- Pfizer-Laubach Career Development Chair, MIT (2002)
- NIH Post-Doctoral Fellowship, NIH (2001)
- U. C. Berkeley Chancellor's Fellowship, U. C. Berkeley (2000)
- Division of Organic Chemistry Graduate Fellowship, American Chemical Society (1999)
- NSF Pre-Doctoral Fellowship, National Science Foundation (1996)
- Thomas Temple Hoopes Prize, Harvard University (1996)
- Radcliffe Dean's Fellowship, Harvard University (1995)
- Undergraduate Research Fellowship in Synthetic Organic Chemistry, Pfizer and Harvard University (1994)

PROFESSIONAL EDUCATION

- Post-doc, University of California, San Diego , Biochemistry (with Roger Tsien) (2002)
- Ph.D., University of California, Berkeley , Chemistry (with Peter Schultz) (2000)
- A.B., Harvard University , Chemistry (research advisor E. J. Corey) (1996)
- High school, Texas Academy of Math and Science (1992)

LINKS

- Laboratory website: http://www.tinglab.org

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The goal of our laboratory is to develop, scale up, and broadly disseminate molecular technologies for mapping cells and functional circuits. At the sub-cellular scale, maps document the spatial organization of proteins, RNA, DNA, and metabolites with nanometer precision and temporal acuity on the order of seconds. Maps also chart the connectivity between these molecules, elucidating the circuits and signaling processes that give rise to function.

Beyond the single cell, we also strive to map cellular ensembles, such as brain tissue. Can we create tools that contribute to the construction of cell and tissue atlases, and can we map the cellular circuits that give rise to function and behavior? To achieve these ambitious goals, our laboratory has focused on the development of scalable technologies to detect, measure, and manipulate molecules and circuits, both at the sub-cellular level, and at the level of cell populations.

Teaching

COURSES

2020-21

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)

2019-20

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)

2018-19

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)

2017-18

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Shawn Gillespie, Anish Roy, Josh Tycko

Postdoctoral Faculty Sponsor

Rongbing Huang, Nicholas Kalogriopoulos, Christina Kim, Songyi Lee, Wei Qin, Matt Ravalin, Boxuan Zhao

Doctoral Dissertation Advisor (AC)

Peter Cavanagh, Kelvin Cho, Robert Coukos, Elbegduuren Erdenee, Heegwang Roh, Sifei Yin

Undergraduate Major Advisor

Panos Vandris

Doctoral (Program)

Elbegduuren Erdenee

Publications

PUBLICATIONS

- **Atlas of Subcellular RNA Localization Revealed by APEX-Seq.** *Cell*
  Fazal, F. M., Han, S., Parker, K. R., Kaewsapsak, P., Xu, J., Boettiger, A. N., Chang, H. Y., Ting, A. Y.
  2019
- **Efficient proximity labeling in living cells and organisms with TurboID** *NATURE BIOTECHNOLOGY*
  Branon, T. C., Bosch, J. A., Sanchez, A. D., Udeshi, N. D., Svinkina, T., Carr, S. A., Feldman, J. L., Perrimon, N., Ting, A. Y.
  2018; 36 (9): 880-+
- **A light- and calcium-gated transcription factor for imaging and manipulating activated neurons.** *Nature biotechnology*
  Wang, W., Wildes, C. P., Pattarabanjird, T., Sanchez, M. I., Glober, G. F., Matthews, G. A., Tye, K. M., Ting, A. Y.
  2017
- **Proximity labeling in mammalian cells with TurboID and split-TurboID.** *Nature protocols*
  Cho, K. F., Branon, T. C., Udeshi, N. D., Myers, S. A., Carr, S. A., Ting, A. Y.
  2020
- **RNA-protein interaction mapping via MS2- or Cas13-based APEX targeting.** *Proceedings of the National Academy of Sciences of the United States of America*
  Han, S., Zhao, B. S., Myers, S. A., Carr, S. A., He, C., Ting, A. Y.
  2020
- **Split-TurboID enables contact-dependent proximity labeling in cells** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Cho, K. F., Branon, T. C., Rajeev, S., Svinkina, T., Udeshi, N. D., Thoudam, T., Kwak, C., Rhee, H., Lee, I., Carr, S. A., Ting, A. Y.
  2020; 117 (22): 12143–54
- **Split-TurboID enables contact-dependent proximity labeling in cells.** *Proceedings of the National Academy of Sciences of the United States of America*
  Cho, K. F., Branon, T. C., Rajeev, S., Svinkina, T., Udeshi, N. D., Thoudam, T., Kwak, C., Rhee, H., Lee, I., Carr, S. A., Ting, A. Y.

2020

- **Cell-Surface Proteomic Profiling in the Fly Brain Uncovers Wiring Regulators.** *Cell*
  Li, J., Han, S., Li, H., Udeshi, N. D., Svinkina, T., Mani, D. R., Xu, C., Guajardo, R., Xie, Q., Li, T., Luginbuhl, D. J., Wu, B., McLaughlin, et al
  2020

- **Directed evolution improves the catalytic efficiency of TEV protease.** *Nature methods*
  Sanchez, M. I., Ting, A. Y.
  2019

- **Luciferase-LOV BRET enables versatile and specific transcriptional readout of cellular protein-protein interactions** *ELIFE*
  Kim, C. K., Cho, K. F., Kim, M., Ting, A. Y.
  2019; 8

- **Directed Evolution of Split APEX2 Peroxidase.** *ACS chemical biology*
  Han, Y., Branon, T. C., Martell, J. D., Boassa, D., Shechner, D., Ellisman, M. H., Ting, A.
  2019; 14 (4): 619–35

- **Proximity labeling of protein complexes and cell type-specific organellar proteomes in Arabidopsis enabled by TurboID.** *eLife*
  Mair, A., Xu, S. L., Branon, T. C., Ting, A. Y., Bergmann, D. C.
  2019; 8

- **Proteomic mapping of cytosol-facing outer mitochondrial and ER membranes in living human cells by proximity biotinylation** *ELIFE*
  Hung, V., Lam, S. S., Udeshi, N. D., Svinkina, T., Guzman, G., Mootha, V. K., Carr, S. A., Ting, A. Y.
  2017; 6

- **An Approach to Spatiotemporally Resolve Protein Interaction Networks in Living Cells** *CELL*
  Lobingier, B. T., Huttenhain, R., Eichel, K., Miller, K. B., Ting, A. Y., von Zastrow, M., Krogan, N. J.
  2017; 169 (2): 350-360

- **Proximity Biotinylation as a Method for Mapping Proteins Associated with mtDNA in Living Cells.** *Cell chemical biology*
  Han, S., Udeshi, N. D., Deerinck, T. J., Svinkina, T., Ellisman, M. H., Carr, S. A., Ting, A. Y.
  2017

- **Live-cell mapping of organelle-associated RNAs via proximity biotinylation combined with protein-RNA crosslinking.** *eLife*
  Kaewsapsak, P., Shechner, D. M., Mallard, W., Rinn, J. L., Ting, A. Y.
  2017; 6

- **RNA targeting with CRISPR-Cas13.** *Nature*
  Abudayyeh, O. O., Gootenberg, J. S., Essletzbichler, P., Han, S., Joung, J., Belanto, J. J., Verdine, V., Cox, D. B., Kellner, M. J., Regev, A., Lander, E. S., Voytas, D. F., Ting, et al
  2017; 550 (7675): 280–84

- **Time-gated detection of protein-protein interactions with transcriptional readout.** *eLife*
  Kim, M. W., Wang, W., Sanchez, M. I., Coukos, R., von Zastrow, M., Ting, A. Y.
  2017; 6

- **Proteomic Analysis of Unbounded Cellular Compartments: Synaptic Clefts.** *Cell*
  Loh, K. H., Stawski, P. S., Draycott, A. S., Udeshi, N. D., Lehrman, E. K., Wilton, D. K., Svinkina, T., Deerinck, T. J., Ellisman, M. H., Stevens, B., Carr, S. A., Ting, A. Y.
  2016; 166 (5): 1295-1307 e21

- **A split horseradish peroxidase for the detection of intercellular protein-protein interactions and sensitive visualization of synapses.** *Nature biotechnology*
  Martell, J. D., Yamagata, M., Deerinck, T. J., Phan, S., Kwa, C. G., Ellisman, M. H., Sanes, J. R., Ting, A. Y.
  2016; 34 (7): 774–80

- **Directed evolution of APEX2 for electron microscopy and proximity labeling** *NATURE METHODS*
  Lam, S. S., Martell, J. D., Kamer, K. J., Deerinck, T. J., Ellisman, M. H., Mootha, V. K., Ting, A. Y.
  2015; 12 (1): 51-54

- **Computational design of a red fluorophore ligase for site-specific protein labeling in living cells** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Liu, D. S., Nivon, L. G., Richter, F., Goldman, P. J., Deerinck, T. J., Yao, J. Z., Richardson, D., Phipps, W. S., Ye, A. Z., Ellisman, M. H., Drennan, C. L., Baker, D., Ting, et al
  2014; 111 (43): E4551-E4559
- **Proteomic Mapping of the Human Mitochondrial Intermembrane Space in Live Cells via Ratiometric APEX Tagging** *MOLECULAR CELL*
  Hung, V., Zou, P., Rhee, H., Udeshi, N. D., Cracan, V., Svinkina, T., Carr, S. A., Mootha, V. K., Ting, A. Y.
  2014; 55 (2): 332-341
- **Proteomic Mapping of Mitochondria in Living Cells via Spatially Restricted Enzymatic Tagging** *SCIENCE*
  Rhee, H., Zou, P., Udeshi, N. D., Martell, J. D., Mootha, V. K., Carr, S. A., Ting, A. Y.
  2013; 339 (6125): 1328-1331
- **Imaging Trans-Cellular Neurexin-Neuroligin Interactions by Enzymatic Probe Ligation** *PLOS ONE*
  Liu, D. S., Loh, K. H., Lam, S. S., White, K. A., Ting, A. Y.
  2013; 8 (2)
- **Quantum Dot Targeting with Lipoic Acid Ligase and Halo Tag for Single-Molecule Imaging on Living Cells** *ACS NANO*
  Liu, D. S., Phipps, W. S., Loh, K. H., Howarth, M., Ting, A. Y.
  2012; 6 (12): 11080-11087
- **Engineered ascorbate peroxidase as a genetically encoded reporter for electron microscopy** *NATURE BIOTECHNOLOGY*
  Martell, J. D., Deerinck, T. J., Sancak, Y., Poulos, T. L., Mootha, V. K., Sosinsky, G. E., Ellisman, M. H., Ting, A. Y.
  2012; 30 (11): 1143-?
- **Fluorophore Targeting to Cellular Proteins via Enzyme-Mediated Azide Ligation and Strain-Promoted Cycloaddition** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Yao, J. Z., Uttamapinant, C., Poloukhtine, A., Baskin, J. M., Codelli, J. A., Sletten, E. M., Bertozzi, C. R., Popik, V. V., Ting, A. Y.
  2012; 134 (8): 3720-3728
- **Diels-Alder Cycloaddition for Fluorophore Targeting to Specific Proteins inside Living Cells** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Liu, D. S., Tangpeerachaikul, A., Selvaraj, R., Taylor, M. T., Fox, J. M., Ting, A. Y.
  2012; 134 (2): 792-795
- **Fast, Cell-Compatible Click Chemistry with Copper-Chelating Azides for Biomolecular Labeling** *ANGEWANDTE CHEMIE-INTERNATIONAL EDITION*
  Uttamapinant, C., Tangpeerachaikul, A., Grecian, S., Clarke, S., Singh, U., Slade, P., Gee, K. R., Ting, A. Y.
  2012; 51 (24): 5852-5856
- **Imaging Protein-Protein Interactions inside Living Cells via Interaction-Dependent Fluorophore Ligation** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Slavoff, S. A., Liu, D. S., Cohen, J. D., Ting, A. Y.
  2011; 133 (49): 19769-19776
- **Structure-Guided Engineering of a Pacific Blue Fluorophore Ligase for Specific Protein Imaging in Living Cells** *BIOCHEMISTRY*
  Cohen, J. D., Thompson, S., Ting, A. Y.
  2011; 50 (38): 8221-8225
- **Imaging LDL Receptor Oligonnerization during Endocytosis Using a Co-internalization Assay** *ACS CHEMICAL BIOLOGY*
  Zou, P., Ting, A. Y.
  2011; 6 (4): 308-313
- **Synthesis of 7-Aminocoumarin by Buchwald-Hartwig Cross Coupling for Specific Protein Labeling in Living Cells** *CHEMBIOCHEM*
  Jin, X., Uttamapinant, C., Ting, A. Y.
  2011; 12 (1): 65-70
- **A fluorophore ligase for site-specific protein labeling inside living cells** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Uttamapinant, C., White, K. A., Baruah, H., Thompson, S., Fernandez-Suarez, M., Puthenveetil, S., Ting, A. Y.
  2010; 107 (24): 10914-10919

- **Yeast Display Evolution of a Kinetically Efficient 13-Amino Acid Substrate for Lipoic Acid Ligase** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Puthenveetil, S., Liu, D. S., White, K. A., Thompson, S., Ting, A. Y.
  2009; 131 (45): 16430-16438

- **Fluorescent probes for super-resolution imaging in living cells** *NATURE REVIEWS MOLECULAR CELL BIOLOGY*
  Fernandez-Suarez, M., Ting, A. Y.
  2008; 9 (12): 929-943

- **Protein-protein interaction detection in vitro and in cells by proximity biotinylation** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Fernandez-Suarez, M., Chen, T. S., Ting, A. Y.
  2008; 130 (29): 9251-?

- **Monovalent, reduced-size quantum dots for imaging receptors on living cells** *NATURE METHODS*
  Howarth, M., Liu, W., Puthenveetil, S., Zheng, Y., Marshall, L. F., Schmidt, M. M., Wittrup, K. D., Bawendi, M. G., Ting, A. Y.
  2008; 5 (5): 397-399

- **Expanding the substrate tolerance of biotin ligase through exploration of enzymes from diverse species** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Slavoff, S. A., Chen, I., Choi, Y., Ting, A. Y.
  2008; 130 (4): 1160-?

- **An engineered aryl azide ligase for site-specific mapping of protein-protein interactions through photo-cross-linking** *ANGEWANDTE CHEMIE-INTERNATIONAL EDITION*
  Baruah, H., Puthenveetil, S., Choi, Y., Shah, S., Ting, A. Y.
  2008; 47 (37): 7018-7021

- **Imaging proteins in live mammalian cells with biotin ligase and monovalent streptavidin** *NATURE PROTOCOLS*
  Howarth, M., Ting, A. Y.
  2008; 3 (3): 534-545

- **Redirecting lipoic acid ligase for cell surface protein labeling with small-molecule probes** *NATURE BIOTECHNOLOGY*
  Fernandez-Suarez, M., Baruah, H., Martinez-Hernandez, L., Xie, K. T., Baskin, J. M., Bertozzi, C. R., Ting, A. Y.
  2007; 25 (12): 1483-1487

- **Phage display evolution of a peptide substrate for yeast biotin ligase and application to two-color quantum dot labeling of cell surface proteins** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Chen, I., Choi, Y., Ting, A. Y.
  2007; 129 (20): 6619-6625

- **Synthesis of a ketone analogue of biotin via the intramolecular Pauson-Khand reaction** *ORGANIC LETTERS*
  McNeill, E., Chen, I., Ting, A. Y.
  2006; 8 (20): 4593-4595

- **Transglutaminase-catalyzed site-specific conjugation of small-molecule probes to proteins in vitro and on the surface of living cells** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Lin, C. W., Ting, A. Y.
  2006; 128 (14): 4542-4543

- **A monovalent streptavidin with a single femtomolar biotin binding site** *NATURE METHODS*
  Howarth, M., Chinnapen, D. J., Gerrow, K., Dorrestein, P. C., Grandy, M. R., Kelleher, N. L., El-Husseini, A., Ting, A. Y.
  2006; 3 (4): 267-273

- **Giving cells a new sugar-coating** *NATURE CHEMICAL BIOLOGY*
  Howarth, M., Ting, A. Y.
  2006; 2 (3): 127-128

- **Targeting quantum dots to surface proteins in living cells with biotin ligase** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Howarth, M., Takao, K., Hayashi, Y., Ting, A. Y.
  2005; 102 (21): 7583-7588

- **Site-specific labeling of proteins with small molecules in live cells** *CURRENT OPINION IN BIOTECHNOLOGY*
  Chen, I., Ting, A. Y.
  2005; 16 (1): 35-40
- **Site-specific labeling of cell surface proteins with biophysical probes using biotin ligase** *NATURE METHODS*
  Chen, I., Howarth, M., Lin, W. Y., Ting, A. Y.
  2005; 2 (2): 99-104
- **Genetically encoded fluorescent reporters of histone methylation in living cells** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Lin, C. W., Jao, C. Y., Ting, A. Y.
  2004; 126 (19): 5982-5983
- **A genetically encoded fluorescent reporter of histone phosphorylation in living cells** *ANGEWANDTE CHEMIE-INTERNATIONAL EDITION*
  Lin, C. W., Ting, A. Y.
  2004; 43 (22): 2940-2943