

# Masakazu Iwai

---

Bioenergetics Department  
Molecular Biophysics & Integrated Bioimaging Division  
Lawrence Berkeley National Laboratory, Berkeley, USA

431 Koshland Hall (Niyogi lab)  
University of California  
Berkeley, CA 94720-3102  
Office: +1 (510) 642-4034  
E-mail: miwai@berkeley.edu  
<https://masakazuiwai.github.io>

## Professional Experience

---

- 2018-Present     **Research Scientist**, Molecular Biophysics & Integrated Bioimaging Division, Lawrence Berkeley National Laboratory, Berkeley, USA
- 2015-2018       **Postdoctoral Researcher**, Molecular Biophysics & Integrated Bioimaging Division, Lawrence Berkeley National Laboratory, Berkeley, USA
- 2012-2015       **Project Researcher**, Precursory Research for Embryonic Science and Technology, Japan Science and Technology Agency, Japan
- 2009-2012       **Special Postdoctoral Researcher**, Live Cell Molecular Imaging Research Team, RIKEN Advanced Science Institute, Japan

## Education

---

- Ph.D.       Life Science, 2009: Hokkaido University, Sapporo, Hokkaido, Japan
- M.S.       Environmental Ecology, 2006: Hokkaido University, Sapporo, Hokkaido, Japan
- B.S.       Botany, 2003: Humboldt State University, Arcata, CA, USA

## Publications

---

\*Corresponding author(s)

26. Iwai M\*, Chen JJ, Park S, Yoneda Y, Schmid EM, Fletcher DA, Fleming GR, Niyogi KK (2020) Variable optical properties of light-harvesting complex II revisited. *bioRxiv* (preprint) DOI:10.1101/2020.10.05.312405
25. Arsenault EA, Yoneda Y, Iwai M, Niyogi KK, Fleming GR\* (2020) The role of mixed vibronic  $Q_y$ - $Q_x$  states in green light absorption of light-harvesting complex II. *Nature Communications* 11: 6011. DOI:10.1038/s41467-020-19800-y (*Research Square* DOI:10.21203/rs.3.rs-46465/v1)
24. Onoa B\*, Fukuda S, Iwai M, Bustamante C, Niyogi KK\* (2020) Atomic force microscopy visualizes mobility of photosynthetic proteins in grana thylakoid membranes. *Biophysical Journal* 118: 1-11. DOI:10.1016/j.bpj.2020.02.029 (*bioRxiv* DOI:10.1101/426759)
23. Arsenault EA, Yoneda Y, Iwai M, Niyogi KK, Fleming GR\* (2020) Vibronic mixing enables ultrafast energy flow in light-harvesting complex II. *Nature Communications* 11: 1460. DOI:10.1038/s41467-020-14970-1
22. Perlaza K, Toutkoushian H, Boone M, Lam M, Iwai M, Jonikas MC, Walter P\*, Ramundo S\* (2019) The Mars1 kinase confers photoprotection through signaling in the chloroplast unfolded protein response. *eLife* 8: e49577. DOI:10.7554/eLife.49577

21. Roth MS\*, Westcott D, **Iwai M**, Niyogi KK\* (2019) Hexokinase is necessary for glucose-mediated photosynthesis repression and lipid accumulation in a green alga. *Communications Biology* 2: 347-357. DOI:10.1038/s42003-019-0577-1
20. Yokono M\*, Takabayashi A, Kishimoto J, Fujita T, **Iwai M**, Murakami A, Akimoto S, Tanaka A (2019) The PSI-PSII megacomplex in green plants. *Plant & Cell Physiology* 60: 1098-1108. DOI:10.1093/pcp/pcz026
19. Park S, Steen C, Lyska D, Fischer AL, Endelman B, **Iwai M**, Niyogi KK, Fleming GR\* (2019) Chlorophyll-carotenoid excitation energy transfer and charge transfer in *Nannochloropsis oceanica* for the regulation of photosynthesis. *Proceedings of the National Academy of Sciences of the United States of America* 116: 3385-3390. DOI:10.1073/pnas.1819011116
18. Roth MS\*, Gallaher SD, Westcott DJ, **Iwai M**, Louie KB, Mueller M, Walter A, Foflonker F, Bowen BP, Ataii NN, Song J, Chen J-H, Blaby-Haas CE, Larabell C, Auer M, Northen TR, Merchant SS, Niyogi KK\* (2019) Regulation of oxygenic photosynthesis during trophic transitions in the green alga *Chromochloris zofingiensis*. *The Plant Cell* 31: 579-601. DOI: 10.1105/tpc.18.00742
17. **Iwai M**†\*, Grob P†, Iavarone AT, Nogales E, Niyogi KK\* (2018) A unique supramolecular organization of photosystem I in the moss *Physcomitrella patens*. *Nature Plants* 4: 904-909. †Authors contributed equally. DOI:10.1038/s41477-018-0271-1
16. Park S, Fischer AL, Steen C, **Iwai M**, Morris JM, Walla PJ, Niyogi KK, Fleming GR\* (2018) Chlorophyll-carotenoid excitation energy transfer in high-light-acclimating thylakoid membranes investigated by snapshot transient absorption spectroscopy. *Journal of the American Chemical Society* 140, 11965-11973. DOI:10.1021/jacs.8b04844
15. **Iwai M**\*, Roth MS, Niyogi KK\* (2018) Subdiffraction-resolution live-cell imaging for visualizing thylakoid dynamics. *The Plant Journal* 96, 233-243. DOI:10.1111/tpj.14021.
14. **Iwai M**\*, Yokono M (2017) Light-harvesting antenna complexes in the moss *Physcomitrella patens*: implications for the evolutionary transition from green algae to land plants. *Current Opinion in Plant Biology* 37, 94-101. DOI:10.1016/j.pbi.2017.04.002
13. Kromdijk J, Głowacka K, Leonelli L, Gabilly S, **Iwai M**, Niyogi KK\*, Long SP\* (2016) Improving photosynthesis and crop productivity by accelerating recovery from photoprotection. *Science* 354, 857-861. DOI:10.1126/science.aai8878
12. **Iwai M**\*, Yokono M, Kurokawa K, Ichihara A, Nakano A (2016) Live-cell visualization of excitation energy dynamics in chloroplast thylakoid structures. *Scientific Reports* 6, 29940. DOI:10.1038/srep29940
11. **Iwai M**\*, Yokono M, Nakano A (2015) Toward understanding the multiple spatiotemporal dynamics of chlorophyll fluorescence. *Plant Signaling & Behavior* 10:6, e1022014. DOI:10.1080/15592324.2015.1022014
10. **Iwai M**\*, Yokono M, Kono M, Noguchi K, Akimoto S, Nakano A (2015) Light-harvesting complex Lhcb9 confers a green alga-type photosystem I supercomplex to the moss *Physcomitrella patens*. *Nature Plants* 1, 34-40. DOI:10.1038/nplants.2014.8
9. **Iwai M**\*, Yokono M, Nakano A (2014) Visualizing structural dynamics of thylakoid membranes. *Scientific Reports* 4, 3768. DOI:10.1038/srep03768
8. **Iwai M**\*, Pack C-G, Takenaka Y, Sako Y, Nakano A (2013) Photosystem II antenna phosphorylation-dependent protein diffusion determined by fluorescence correlation spectroscopy. *Scientific Reports* 3, 2833. DOI:10.1038/srep02833
7. **Iwai M**†, Takizawa K†, Tokutsu R, Okamuro A, Takahashi Y, Minagawa J\* (2010) Isolation of the elusive supercomplex that drives cyclic electron flow in photosynthesis. *Nature* 464: 1210-1213. †Authors contributed equally. DOI:10.1038/nature08885

6. Iwai M, Yokono M, Inada N, Minagawa J\* (2010) Live-cell imaging of photosystem II antenna dissociation during state transitions. *Proceedings of the National Academy of Sciences of the United States of America* 107: 2337-2342. DOI:10.1073/pnas.0908808107
5. Swingley WD, Iwai M, Chen Y, Ozawa S, Takizawa K, Takahashi Y, Minagawa, J\* (2010) Characterization of photosystem I antenna proteins in the prasinophyte *Ostreococcus tauri*. *Biochimica et Biophysica Acta* 1797: 1458-1464. DOI:10.1016/j.bbabi.2010.04.017
4. Tokutsu R, Iwai M, Minagawa J\* (2009) CP29, a monomeric light-harvesting complex II protein, is essential for state transitions in *Chlamydomonas reinhardtii*. *The Journal of Biological Chemistry* 284: 7777-7782. DOI:10.1074/jbc.m809360200
3. Iwai M, Takahashi Y, Minagawa J\* (2008) Molecular remodeling of photosystem II during state transitions in *Chlamydomonas reinhardtii*. *The Plant Cell* 20: 2177-2189. DOI:10.1105/tpc.108.059352
2. Iwai M, Kato N, Minagawa J\* (2007) Distinct physiological responses to a high light and low CO<sub>2</sub> environment revealed by fluorescence quenching in phototrophically grown *Chlamydomonas reinhardtii*. *Photosynthesis Research* 94: 307-314. DOI:10.1007/s11120-007-9220-y
1. Takahashi H†, Iwai M†, Takahashi Y, Minagawa J\* (2006) Identification of the mobile light-harvesting complex II polypeptides for state transitions in *Chlamydomonas reinhardtii*. *Proceedings of the National Academy of Sciences of the United States of America* 103: 477-482. †Authors contributed equally. DOI:10.1073/pnas.0509952103

### Fellowships, Grants & Awards

---

2019	<b>Talk Award - 28th Western Photosynthesis Conference 2019:</b> The role of Lhcb9 in the unique photosystem I supercomplex formation in the moss <i>Physcomitrella patens</i>
2014-2015	<b>Grant-in-Aid for Challenging Exploratory Research - Japan Society for the Promotion of Science:</b> Development of proteoliposome reconstitution imaging of thylakoid membrane proteins
2012-2015	<b>Precursory Research for Embryonic Science and Technology - Japan Science and Technology Agency:</b> Study of plant photoadaptation mechanisms by using live cell imaging techniques
2011-2013	<b>Grant-in-Aid for Young Scientists (A) - Japan Society for the Promotion of Science:</b> Investigation of light energy redistribution mechanisms under stress environments in the moss <i>Physcomitrella patens</i>
2011	<b>Individual Collaborative Research Projects - National Institute of Basic Biology:</b> Spectroscopy analysis of photoacclimation mechanisms in <i>Physcomitrella patens</i>
2010	<b>Grant-in-Aid for Young Scientists (B) - Japan Society for the Promotion of Science:</b> Visualization of photosynthetic protein complex network during photoacclimation mechanisms (Withdrawn)
2010	<b>Individual Collaborative Research Grant - Institute of Low Temperature Science, Hokkaido University:</b> The study of photosynthetic activities of giant chloroplasts in <i>Physcomitrella patens</i>
2010	<b>Collaboration Seed Fund - RIKEN:</b> Nano-scale analysis of chloroplast thylakoid membranes using atomic force microscopy
2009-2010	<b>Grant-in-Aid for Young Scientists (Start-up) - Japan Society for the Promotion of Science:</b> Development of live-cell imaging for photosystem proteins by using the <i>Physcomitrella patens</i> giant chloroplasts
2009-2011	<b>Grant for Special Postdoctoral Researchers - RIKEN:</b> Visualization of thylakoid membrane dynamics during photoacclimation
2006-2009	<b>Grant-in-Aid for JSPS Fellows (DC1) - Japan Society for the Promotion of Science:</b> Investigation of photoacclimation mechanisms of light-harvesting complex proteins using the green alga <i>Chlamydomonas reinhardtii</i>

- 2005-2006 **Nara Institute of Science and Technology "Plant Science Education Project" - The Ministry of Education, Culture, Sports, Science and Technology:** Proteomics and visualization of photosynthetic proteins during state transitions
- 2004 **Institute of Low Temperature Science, Hokkaido University:** Director Leadership Fund (by Prof. Takeo Hondoh) - Travel award for The 13th International Conference on Photosynthesis, Montreal, Canada

### Professional Presentations

---

- 2020 Department Seminar at Northern Illinois University (Invited online talk)
- 2020 Big Quantum in Proteins International Meeting (Invited online talk)
- 2020 Bioenergetics Seminar, Berkeley, CA, USA (Online talk)
- 2020 29th Western Photosynthesis Conference, Bodega Bay, CA, USA (Talk)
- 2019 28th Western Photosynthesis Conference, Friday Harbor, WA, USA (Talk & Poster)
- 2018 Molecular Biophysics & Integrated Bioimaging Division Annual Meeting, Berkeley, CA, USA (Invited Talk)
- 2016 Bioenergetics Seminar, Berkeley, CA, USA (Talk)
- 2016 The 13th Annual Advanced Imaging Methods Workshop, Berkeley, CA, USA (Poster)
- 2015 Plant & Microbial Biology Department Student & Postdoc Seminar, Berkeley, CA, USA (Talk)
- 2015 The 56th Annual Meeting of Japan Society of Plant Physiologists, Tokyo, Japan (Talk)
- 2015 The 17th Plant Organelle Workshop, Tokyo, Japan (Invited Talk)
- 2015 Precursory Research for Embryonic Science and Technology Project Research Seminar, Tokyo, Japan (Talk)
- 2015 RIKEN 4D Symposium, Saitama, Japan (Poster)
- 2014 Core Research for Evolutionary Science and Technology/Precursory Research for Embryonic Science and Technology Joint Project Meeting, Tokyo, Japan (Talk)
- 2014 RIKEN Symposium for Advanced Photonics, Saitama, Japan (Poster)
- 2014 The 40th Annual Meeting of the Japan Society for Laser Microscopy, Saitama, Japan (Talk)
- 2014 Precursory Research for Embryonic Science and Technology Project Meeting, Shizuoka, Japan (Talk)
- 2014 RIKEN Symposium for Advanced Photonics, Saitama, Japan (Poster)
- 2014 Japan Society for the Promotion of Science Project Seminar (Invited Talk)
- 2013 Core Research for Evolutionary Science and Technology/Precursory Research for Embryonic Science and Technology Joint Project Meeting, Tokyo, Japan (Talk)
- 2013 RIKEN Symposium for Advanced Photonics, Saitama, Japan (Poster)
- 2013 Precursory Research for Embryonic Science and Technology Project Meeting, Kyoto, Japan (Talk)
- 2013 The 4th Annual Symposium of The Japanese Society of Photosynthesis Research, Nagoya, Japan (Invited Talk)
- 2013 The 54th Annual Meeting of Japan Society of Plant Physiologists, Okayama, Japan (Talk)
- 2013 RIKEN Kibo Symposium, Saitama, Japan (Invited Talk)
- 2012 RIKEN Extreme Photonics Research Symposium, Saitama, Japan (Poster)
- 2012 Precursory Research for Embryonic Science and Technology Project Meeting, Tokyo, Japan (Talk)
- 2012 RIKEN Symposium, Saitama, Japan (Invited Talk)
- 2012 Okayama University International Symposium, Okayama, Japan (Poster)
- 2012 The 50th Annual Meeting of the Biophysical Society of Japan, Nagoya, Japan (Poster)
- 2012 Japanese-Finnish Photosynthesis Research Conference, Turku, Finland (Invited Talk)
- 2012 Core Research for Evolutionary Science and Technology/Precursory Research for Embryonic Science and Technology Joint Project Meeting, Hokkaido, Japan (Invited Talk)
- 2012 Precursory Research for Embryonic Science and Technology Project Meeting, Shizuoka, Japan (Talk)
- 2012 Gordon Research Conference, Davidson, NC, USA (Poster)
- 2012 The 15th Annual Moss International Conference, The Bronx, NY, USA (Poster)

- 2012 The 53rd Annual Meeting of Japan Society of Plant Physiologists, Kyoto, Japan (Talk)
- 2012 Kyoto University Research Seminar, Kyoto, Japan (Invited Talk)
- 2012 Precursory Research for Embryonic Science and Technology Kick-Off Meeting, Kyoto, Japan (Talk)
- 2011 The 8th Chlamydomonas Workshop, Tokyo, Japan (Talk)
- 2011 The 24th Japanese Association of Plant Lipid Researchers Annual Symposium, Tokyo, Japan (Poster)
- 2011 RIKEN Extreme Photonics Research Seminar, Saitama, Japan (Poster)
- 2011 The 52nd Annual Meeting of Japan Society of Plant Physiologists, Sendai, Japan (Talk)
- 2011 Institute for Protein Research Seminar, Osaka, Japan (Poster)
- 2010 RIKEN Extreme Photonics Research Seminar, Saitama, Japan (Poster)
- 2010 Tokyo University Research Seminar, Tokyo, Japan (Invited Talk)
- 2010 The 51st Annual Meeting of Japan Society of Plant Physiologists, Kumamoto, Japan (Talk)
- 2010 RIKEN Advanced Science Institute-Yokohama Joint Research Forum, Yokohama, Japan (Poster)
- 2009 RIKEN Advanced Science Institute- BioResource Research Center Joint Research Forum, Saitama, Japan (Poster)
- 2009 RIKEN Extreme Photonics Research Seminar, Saitama, Japan (Poster)
- 2009 RIKEN Seminar, Saitama, Japan (Talk)
- 2009 Nara Institute of Science and Technology Symposium, Nara, Japan (Invited Talk)
- 2009 The 50th Annual Meeting of Japan Society of Plant Physiologists, Nagoya, Japan (Talk)
- 2008 Nara Institute of Science and Technology Symposium, Nara, Japan (Invited Talk)
- 2008 The 49th Annual Meeting of Japan Society of Plant Physiologists, Sapporo, Japan (Talk)
- 2007 The Hokkaido Branch meeting for Botanical Society of Japan, Sapporo, Japan (Invited Talk)
- 2007 Satellite Meeting of the 14th International Congress on Photosynthesis "State Transitions", London, UK (Invited Talk)
- 2007 The 14th International Congress on Photosynthesis, Glasgow, Scotland (Poster)
- 2007 Nara Institute of Science and Technology Workshop, Nara, Japan (Talk)
- 2006 Japanese-Finnish Seminar, Nara, Japan (Talk & Poster)
- 2006 The 47th Annual Meeting of Japan Society of Plant Physiologists, Tsukuba, Japan (Talk)
- 2006 Nara Institute of Science and Technology Workshop, Nara, Japan (Talk)
- 2005 The 5th Chlamydomonas Workshop, Tsukuba, Japan (Talk)
- 2005 The 46th Annual Meeting of Japan Society of Plant Physiologists, Niigata, Japan (Talk)
- 2004 The 13th International Congress on Photosynthesis Research, Montreal, Canada (Poster)

## Peer Review Services

---

*Algal Research, Biochimica et Biophysica Acta, Botany Letters, Current Opinion in Plant Biology, Environmental and Experimental Botany, French National Research Agency, Journal of Visualized Experiments, Langmuir, Nature Plants, Photochemical & Photobiological Sciences, Planta, The Plant Cell, Plant Cell Physiology, Plant Methods, Plant Physiology, Plant Production Science, Proceedings of the National Academy of Sciences of the USA, Scientific Reports*

## Outreach

---

- 2020 Online Science & Career Talk at The International Education Center at Diablo Valley College, CA, USA
- 2020 Online Science & Career Talk at NIC International College in Japan, Tokyo, Japan
- 2019-Present Science Supervisor, Hanazono Junior/High School, Kyoto, Japan
- 2017 Career Talk at Diablo Valley College, Pleasant Hill, CA, USA
- 2016 Invited Lecture, Sonoma State University, CA, USA
- 2014 Science Seminar at Seishin High School and Junior High School, Ibaraki, Japan
- 2012 'Aesthetic' Panel Science Exhibition 2012, Tokyo, Japan
- 2011 A column in In-Cube (Leave a Nest), No. 14, June 2011
- 2011 A column in The Business & Technology Daily News (Feb. 1st, 2011)

- 2010-2014     Biannual Science Talk at NIC International College in Japan, Tokyo, Japan (every Fall and Spring semester during the 5-year period)
- 2010           Invited Science Presentation Contest in Science Agora 2010 at National Museum of Emerging Science and Innovation, Tokyo, Japan
- 2010           Editing Adviser, White Paper on Science and Technology for Children 2010, JST.
- 2010           A column in RIKEN News, Sept. 2010
- 2010           Science Talk at National Museum of Emerging Science and Innovation, Tokyo, Japan
- 2009           Science Presentation Contest in Science Agora 2009 at National Museum of Emerging Science and Innovation, Tokyo, Japan (The 1st place winner)

## **Mentorship**

---

Kylie Ren, Undergraduate Researcher, UC Berkeley (Mar. 2020 - Present)  
 Maddy Chapman, Undergraduate Researcher, UC Berkeley (Jan. 2020 - Present)  
 Victoria Kim, Undergraduate Researcher, UC Berkeley (Nov. 2019 - Present)  
 Valerie Lam, Undergraduate Researcher, Lab Technician, UC Berkeley (Oct. 2019 - Dec. 2020)  
 Christine Pagotan, Undergraduate Researcher, UC Berkeley (Oct. 2019 - Mar. 2020)  
 Veronica Wong, Undergraduate Researcher, UC Berkeley (May 2019 - Present)  
 Kumiko Yanagihara, Undergraduate Researcher, UC Berkeley (Aug. 2018 - Dec. 2019)  
 Mimi Broderson, Lab Technician, UC Berkeley (Sept. 2017 - Apr. 2020)  
 Arnold Chan, Undergraduate Researcher, UC Berkeley (Feb. 2017 - Aug. 2018)  
 Hiroe Watanabe, Lab Technician, RIKEN (Apr. 2012- Mar. 2015)  
 Kaoru Kotoshiba, Lab Technician, RIKEN (Apr. 2012- Mar. 2015)