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RESEARCH INTERESTS

- Mechanobiology of cell and tissue dynamics
- Mechanical role of apoptosis in animal development and in tissue engineering
- Mechanical role of immune cell in apoptotic cell clearance

PROFESSIONAL EXPERIENCE

2019- present	Deputy director, Mechanobiology Institute, Singapore
2018- present	Associate Professor, Department of Biological Sciences, National University of Singapore
2010- 2017	Assistant Professor, Department of Biological Sciences, National University of Singapore,
2010- present	Principal Investigator, Mechanobiology Institute, Singapore
2010- 2017	Principal Investigator, Temasek Life Sciences Laboratory, Singapore
2003- 2010	Postdoctoral Fellow, Physics Department & Free Electron Laser Lab., Duke Univ., USA Supervisor: Dr. Glenn Edwards (Physics), Dr. Dan Kiehart (Biology)
2003	Postdoctoral Fellow, Institute of Laser Engineering, Osaka Univ., Japan. Supervisor: Dr. Ryosuke Kodama, Dr. Kazuo Tanaka

EDUCATION

2003 Ph.D. in Engineering, Osaka Univ., Japan
Adviser: Dr. Ryosuke Kodama, Dr. Kazuo Tanaka
Dissertation: Experimental research on energy transport for Fast Ignition Concept in Inertial Fusion Energy
Research fields: Plasma physics, Accelerator physics, Laser-plasma interaction, Nuclear fusion.

2000 M.S. in Engineering, Osaka Univ., Japan
Adviser: Dr. Hiroyuki Daido, Dr. Kazuo Tanaka
Thesis: X-ray spectroscopic study on additional heating mechanism in Inertial Fusion Energy

1998 B.S. in Engineering, Hokkaido Univ., Japan
Adviser: Dr. Peter Ventzek
Thesis: Simulation of charged particle dynamics in magnetized field

PUBLICATIONS (Mechanobiology)

1. Thomas M, Ladoux B, Toyama Y. *"Desmosomal junctions govern tissue integrity and actomyosin contractility in apoptotic cell extrusion"* **Current Biology** (2020, in press)
2. Tlili S, Yin J, Rupprecht JF, Mendieta-Serrano MA, Weissbart G, Verma N, Teng X, Toyama Y, Prost J, Saunders TE. "Shaping the zebrafish myotome by intertissue friction and active stress" **Proc. Natl. Acad. Sci. U.S.A** 116, 25430-25439 (2019)
3. Zhao P, Teng X, Tantirimudalige SN, Nishikawa M, Wohland T, Toyama T, Motegi F. *"Aurora-A breaks symmetry in contractile actomyosin networks independently of its role in centrosome maturation."* **Developmental Cell**, 48, 631-645.e6 (2019)

4. Chen T, Callan-Jones A, Fedorov E, Ravasio A, Brugués A, Ong HT, Toyama Y, Low BC, Trepat X, Shemesh T, Voituriez R, Ladoux B. *"Large-scale curvature sensing by directional actin flow drives cellular migration mode switching."* **Nature Physics** 15, 393–402 (2019)

5. Sun Z, Toyama Y. *"Three-dimensional forces beyond actomyosin contraction: lessons from fly epithelial deformation."* **Current Opinion in Genetics & Development**, *51*, 96–102 (2018) Review

6. Priti A, Ong HT, Toyama Y, Padmanabhan A, Dasgupta S, Krajnc M, Zaidel-Bar R. "Syncytial germline architecture is actively maintained by contraction of an internal actomyosin corset." **Nature Communications** *9*, 4694 (2018)

7. Constance WD, Mukherjee A, Fisher YE, Pop S, Blanc E, Toyama Y, Williams DW. *"Neurexin and Neuroligin-based adhesion complexes drive axonal arborisation growth independent of synaptic activity."* **eLife**, *7*, e31659 (2018)

8. Sun Z, Amourda C, Shagirov M, Hara Y, Saunders TE, Toyama Y. *"Basolateral protrusion and apical contraction cooperatively drive Drosophila germband extension."* **Nature Cell Biology**, *19*, 375–383 (2017)

9. Saw TB, Doostmohammadi A, Nier V, Kocgozlu L, Thampi S, Toyama Y, Marcq P, Lim CT*, Yeomans JM*, Ladoux B* *"Topological defects in epithelia govern cell death and extrusion"* **Nature**, *544*, 212–216 (2017)

10. Ding WY, Ong HT, Hara Y, Wongsantichon J, Toyama Y, Robinson R, Nedelec F, Zaidel-Bar R *"Plastin increases cortical connectivity facilitating robust polarization and timely cytokinesis"* **Journal of Cell Biology** *216*, 1371-1386 (2017)

11. Wang YH, Hariharan A, Bastianello G, Toyama Y, Shivashankar GV, Foiani M, Sheetz M *"DNA damage causes rapid accumulation of phosphoinositides for ATR signaling"* **Nature Communications** *8*, 2118 (2017)

12. Bertocchi C, Wang Y, Ravasio A, Hara Y, Wu Y, Sailov T, Baird MA, Davidson MW, Zaidel-Bar R, Toyama Y, Ladoux B, Mege RM, Kanchanawong P. *"Nanoscale architecture of cadherin-based cell adhesions"* **Nature Cell Biology** *19*, 28-37 (2017)

13. Teng X, Qin L, Le Borgne R, Toyama Y. *"Remodeling of adhesion and modulation of mechanical tensile forces during apoptosis in Drosophila epithelium."* **Development** *144*, 95-105 (2017)

14. Kocgozlu L*, Saw TB*, Le AP, Yow I, Shagirov M, Wong E, Mège RM, Lim CT, Toyama Y**, Ladoux B** *"Epithelial cell packing induces distinct modes of cell extrusions"* **Current Biology** *26*, 2942-50 (2016) *: co-1st author. **: co-corresponding author

15. Hara Y, Shagirov M, Toyama Y. *"Cell boundary elongation by non-autonomous contractility in cell oscillation."* **Current Biology** *26*, 2388-96 (2016)

16. Ravasio A, Cheddadi I, Chen T, Pereira T, Ong HT, Bertocchi C, Brugues A, Jacinto A, Kabla AJ, Toyama Y, Trepat X, Gov N, Neves de Almeida L, Ladoux B. *"Gap geometry dictates epithelial closure efficiency"* **Nature Communications** *6*, 7683 (2015)

17. Vedula S.R.K, Peyret G, Cheddadi I, Chen T, Brugués A, Hirata H, Lopez-Menendez H, Toyama Y, Almeida L, Trepat X, Lim CT, Ladoux B. *"Mechanics of epithelial closure over non-adherent environments"* **Nature Communications** *6*, 6111 (2015)

18. Kawashima T, Maruyama D, Shagirov M, Hamamura Y, Li J, Yelagandula R, Toyama Y, Berger F. *"Dynamic F-actin movement is essential for fertilization in Arabidopsis thaliana"* **eLife** *3*, 04501 (2014)

19. Vedula S.R.K, Hirata H, Nai MH, Brugés A, Toyama Y, Trepat X, Lim CT and Ladoux B. *"Epithelial bridges maintain tissue integrity during collective cell migration"* **Nature Material** *13*, 87–96 (2014)

20. Teng, X, Toyama Y. "*Apoptotic force: Active mechanical function of cell death during morphogenesis*" **Development Growth and Differentiation**. *53*, 269-276 (2011) Review

PUBLICATIONS (Mechanobiology), Continued

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21. Sokolow, A, Toyama, Y, Kiehart, D.P. and Edwards, G.S. *"Cell ingression and apical shape oscillations during dorsal closure in Drosophila"* **Biophysical Journal** *102*, 969-979 (2012)
22. Layton, A.T.,* Toyama, Y.,* Yang, G-Q.,* Edwards, G.S., Kiehart, D.P., Venakides, S. "*Drosophila Morphogenesis: Tissue Force Laws and the Modeling of Dorsal Closure*" **HFSP** (Human Frontier Science Program) **Journal** *3*, 441-460 (2009). *: Equal contribution.
23. Toyama, Y., Peralta, X.G., Wells, A.R., Kiehart, D.P., and Edwards, G.S. "*Apoptotic force and tissue dynamics during Drosophila embryogenesis*" **Science** *321*, 1683-1686 (2008).
24. Rodriguez-Diaz, A., Toyama, Y., Abravanel, D.L., Wiemann, J.M., Wells, A.R., Tulu, U.S., Edwards, G.S., and Kiehart, D.P. "*Actomyosin purse strings: renewable resources that make morphogenesis robust and resilient*" **HFSP Journal** *2*, 220-237 (2008).
25. Peralta, X.G., Toyama, Y., Kiehart, D.P., and Edwards, G.S. "*Emergent properties during dorsal closure in Drosophila morphogenesis*" **Physical Biology** *5*, Article No.: 015004 (2008).
26. Peralta, X.G., Toyama, Y., Hutson, M.S., Montague, R., Venakides, S., Kiehart, D.P., and Edwards, G.S. "*Upregulation of forces and morphogenic asymmetries in dorsal closure during Drosophila development*" **Biophysical Journal** *92*, 2583-2596 (2007).
27. Kiehart, D.P., Tokutake, Y., Chang, M.S., Hutson, M.S., Wiemann, J., Peralta, X.G., Toyama, Y., Wells, A.R., Rodriguez, A., and Edwards, G.S. *"Ultraviolet Laser Microbeam for Dissection of Drosophila Embryos."* **Cell Biology: A Laboratory Handbook**, 3rd edition, edited by J.E. Celis (2006), pp. 87-103, Elsevier (Chapter 9)

MANUSCRIPTS SUBMITTED (Mechanobiology)

- Bertocchi C, Ravasio A, Ong HT, Toyama Y, Kanchanawong P *"Mechanical Roles of Vinculin/β-catenin interaction in Adherens Junction"*
- Lopez-Menendez H, Kocgozlu L, Saw TB, Le AP, Teng X, D'Alessandro J, Marc-Mege R, Toyama Y, Prost P, Ladoux B *"Emergent modes of apoptotic cell extrusion driven by mechanical instabilities"*
- Anh Phuong Le, Jean-François Rupprecht, René-Marc Mège, Yusuke Toyama, Chwee Teck Lim**, Benoît Ladoux** *"Adhesion-mediated heterogeneous actin organization governs apoptotic cell extrusion"*
- Zhang S, Teng X, Toyama Y, Saunders TE., *"Periodic Oscillations of Myosin-II Mechanically Proofread Cell-Cell Connections to Ensure Robust Formation of the Cardiac Vessel"*

PUBLICATIONS (Nuclear and Plasma Physics, Before NUS**)**

1. Key, M.H., Adam, J.C., Akli, K.U., Borghesi, M., Chen, M.H., Evans, R.G., Freeman, R.R., Habara, H., Hatchett, S.P., Hill, J.M., Heron, A., King, J.A., Kodama, R., Lancaster, K.L., MacKinnon, A.J., Patel, P., Phillips, T., Romagnani, L., Snavely, R.A., Stephens, R., Stoeckl, C., Town, R., Toyama, Y., Zhang, B., Zepf, M., and Norreys, P.A. "*Fast ignition relevant study of the flux of high intensity laser-generated electrons via a hollow cone into a laser-imploded plasma*" **Physics of Plasmas** *15*, 022701-022705 (2008).
2. Snavely, R.A., Zhang, B., Akli, K., Chen, Z., Freeman, R.R., Gu, P., Hatchett, S.P., Hey, D., Hill, J., Key, M.H., Izawa, Y., King, J., Kitagawa, Y., Kodama, R., Langdon, A.B., Lasinski, B.F., Lei, A., MacKinnon, A.J., Patel, P., Stephens, R., Tampo, M., Tanaka, K.A., Town, R., Toyama, Y., Tsutsumi, T., Wilks, S.C., Yabuuchi, T., and Zheng, J. "*Laser generated proton beam focusing and high temperature isochoric heating of solid matter*" **Physics of Plasmas** *14,* 092703-092707 (2007).
3. Nakamura, H., Kodama, R., Nakatsutsumi, M., Tampo, M., and Toyama, Y. "*Development of multichannel wave-coincidence neutron spectrometer for fast ignition experiments*" **Review of Scientific Instruments** *77,* 10E727 (2006).
4. Youssef, A., Kodama, R., Habara, H., Tanaka, K.A., Sentoku, Y., Tampo, M., and Toyama, Y. "*Broad-range neutron spectra identification in ultraintense laser interactions with carbon-deuterated plasma*" **Physics of Plasmas** *12,* 110703-110706 (2005).
5. King, J.A., Akli, K., Zhang, B., Freeman, R.R., Key, M.H., Chen, C.D., Hatchett, S.P., Koch, J.A., MacKinnon, A.J., Patel, P.K., Snavely, R., Town, R.P.J., Borghesi, M., Romagnani, L., Zepf, M., Cowan, T., Habara, H., Kodama, R., Toyama, Y., Karsch, S., Lancaster, K., Murphy, C., Norreys, P., Stephens, R., and Stoeckl, C. "*TiK alpha radiography of Cu-doped plastic microshell implosions via spherically bent crystal imaging*" **Applied Physics Letters** *86,* 191501-191503 (2005).
6. Chen, Z.L., Kodama, R., Nakatsutsumi, M., Nakamura, H., Tampo, M., Tanaka, K.A., Toyama, Y., Tsutsumi, T., and Yabuuchi, T. "*Enhancement of energetic electrons and protons by cone guiding of laser light*" **Physical Review E** *71,* 036403-036407 (2005).
7. Sentoku, Y., Mima, K., Ruhl, H., Toyama, Y., Kodama, R., and Cowan, T.E. "*Laser light and hot electron micro focusing using a conical target*" **Physics of Plasmas** *11*, 3083-3087 (2004).
8. Norreys, P.A., Lancaster, K.L., Murphy, C.D., Habara, H., Karsch, S., Clarke, R.J., Collier, J., Heathcote, R., Hemandez-Gomez, C., Hawkes, S., Neely, D., Hutchinson, M.H.R., Evans, R.G., Borghesi, M., Romagnani, L., Zepf, M., Akli, K., King, J.A., Zhang, B., Freeman, R.R., MacKinnon, A.J., Hatchett, S.P., Patel, P., Snavely, R., Key, M.H., Nikroo, A., Stephens, R., Stoeckl, C., Tanaka, K.A., Norimatsu, T., Toyama, Y., and Kodama, R. "*Integrated implosion/heating studies for advanced fast ignition*" **Physics of Plasmas** *11*, 2746-2754 (2004).
9. Lancaster, K.L., Karsch, S., Habara, H., Beg, F.N., Clark, E.L., Freeman, R., Key, M.H., King, J.A., Kodama, R., Krushelnick, K., Ledingham, K.W.D., McKenna, P., Murphy, C.D., Norreys, P.A., Stephens, R., Stoeckl, C., Toyama, Y., Wei, M.S., and Zepf, M. "*Characterization of Li-7(p,n)Be-7 neutron yields from laser produced ion beams for fast neutron radiography*" **Physics of Plasmas** *11*, 3404-3408(2004).
10. Kodama, R., Sentoku, Y., Chen, Z.L., Kumar, G.R., Hatchett, S.P., Toyama, Y., Cowan, T.E., Freeman, R.R., Fuchs, J., Izawa, Y., Key, M.H., Kitagawa, Y., Kondo, K., Matsuoka, T., Nakamura, H., Nakatsutsumi, M., Norreys, P.A., Norimatsu, T., Snavely, R.A., Stephens, R.B., Tampo, M., Tanaka, K.A., and Yabuuchi, T. "*Plasma devices to guide and collimate a high density of MeV electrons*" **Nature** *432*, 1005-1008 (2004).

PUBLICATIONS (Nuclear and Plasma Physics), Continued

11. Kodama, R., Azechi, H., Fujita, H., Habara, H., Izawa, Y., Jitsuno, T., Jozaki, T., Kitagawa, Y., Krushelnick, K., Matsuoka, T., Mima, K., Miyanaga, N., Nagai, K., Nagatomo, H., Nakai, M., Nishimura, H., Norimatsu, T., Norreys, P., Shigemori, K., Shiraga, H., Sunahara, A., Tanaka, K.A., Tanpo, M., Toyama, Y., Tsubakimoto, K., Yamanaka, T., and Zepf, M. "*Fast plasma heating in a cone-attached geometry - towards fusion ignition*" **Nuclear Fusion** *44*, S276-S283 (2004).

12. Habara, H., Lancaster, K.L., Karsch, S., Murphy, C.D., Norreys, P.A., Evans, R.G., Borghesi, M., Romagnani, L., Zepf, M., Norimatsu, T., Toyama, Y., Kodama, R., King, J.A., Snavely, R., Akli, K., Zhang, B., Freeman, R., Hatchett, S., MacKinnon, A.J., Patel, P., Key, M.H., Stoeckl, C., Stephens, R.B., Fonseca, R.A., and Silva, L.O. "*Ion acceleration from the shock front induced by hole boring in ultraintense laser-plasma interactions*" **Physical Review E** *70* , 046414-046417 (2004).

13. Tanaka, K.A., Kodama, R., Mima, K., Kitagawa, Y., Fujita, H., Miyanaga, N., Nagai, K., Norimatsu, T., Sato, T., Sentoku, Y., Shigemori, K., Sunahara, A., Shozaki, T., Tanpo, M., Toyama, Y., Yabuuchi, T., Zheng, J., Yamanaka, T., Norreys, P.A., Evanse, R., Zepf, M., Krushelnic, K., Dangor, A., Stephens, R., Hatchett, S., Tabak, M., and Turner, R. "*Basic and integrated studies for fast ignition*" **Physics of Plasmas** *10*, 1925-1930 (2003).

14. Kodama, R., Tanaka, K.A., Fujioka, S., Fujita, H., Habara, H., Izawa, Y., Jitsuno, T., Kitagawa, Y., Krushelnick, K., Mima, K., Miyanaga, N., Nagai, K., Norreys, P., Norimatsu, T., Shigemori, K., Shiraga, H., Toyama, Y., Zepf, M., and Yamanaka, T. "*Fast heating of super-solid density plasmas towards laser fusion ignition*" **Plasma Physics and Controlled Fusion** *44*, B109-B119 (2002).

15. Kodama R., Shiraga H., Shigemori K., Toyama Y., Fujioka S., Azechi H., Fujita H., Habara H., Hall T., Izawa Y., Jitsuno T., Kitagawa Y., Krushelnick K.M., Lancaster K.L., Mima K., Nagai K., Nakai M., Nishimura H., Norimatsu T., Norreys P.A., Sakabe S., Tanaka K.A., Youssef A., Zepf M., and Yamanaka T. "*Nuclear fusion - Fast heating scalable to laser fusion ignition*" **Nature** *418*, 933-934 (2002).

16. Kitagawa, Y., Sentoku, Y., Akamatsu, S., Mori, M., Tohyama, Y., Kodama, R., Tanaka, K.A., Fujita, H., Yoshida, H., Matsuo, S., Jitsuno, T., Kawasaki, T., Sakabe, S., Nishimura, H., Izawa, Y., Mima, K., and Yamanaka, T. "*Progress of fast ignitor studies and Petawatt laser construction at Osaka University*" **Physics of Plasmas** *9*, 2202-2207 (2002).

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18. Kodama, R., Norreys, P.A., Mima, K., Dangor, A.E., Evans, R.G., Fujita, H., Kitagawa, Y., Krushelnick, K., Miyakoshi, T., Miyanaga, N., Norimatsu, T., Rose, S.J., Shozaki, T., Shigemori, K., Sunahara, A., Tampo, M., Tanaka, K.A., Toyama, Y., Yamanaka, Y., and Zepf, M. "*Fast heating of ultrahigh-density plasma as a step towards laser fusion ignition*" **Nature** *412*, 798-802 (2001).

19. Kodama, R., Mima, K., Tanaka, K.A., Kitagawa, Y., Fujita, H., Takahashi, K., Sunahara, A., Fujita, K., Habara, H., Jitsuno, T., Sentoku, Y., Matsushita, T., Miyakoshi, T., Miyanaga, N., Norimatsu, T., Setoguchi, H., Sonomoto, T., Tanpo, M., Toyama, Y., and Yamanaka, T. "*Fast ignitor research at the Institute of Laser Engineering, Osaka University*" **Physics of Plasmas** *8*, 2268-2274 (2001).

20. Choi, I.W., Daido, H., Sakaya, N., Tohyama, Y., Izumi, N., Kodama, R., Kitagawa, Y., and Tanaka, K.A. "*Prepulse effect for recombining plasma produced by ultrashort high-intensity lasers*" **Japanese Journal of Applied Physics** Part 1-Regular Papers Short Notes & Review Papers *40*, 1443-1447 (2001).

21. Daido, H., Sebban, S., Sakaya, N., Tohyama, Y., Norimatsu, T., Mima, K., Kato, Y., Wang, S., Gu, Y., Huang, G., Tang, H., Murai, K., Butzbach, R., Uschmann, I., Vollbrecht, M., and Forster, E. "*Experimental characterization of short-wavelength Ni-like soft-x-ray lasing toward the water window*" **Journal of the Optical Society of America B**-Optical Physics *16*, 2295-2299 (1999).