

Pablo Valdivia y Alvarado

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RESEARCH INTERESTS: Soft Robots and Sensors, Bio-inspired Design, Advanced Digital Fabrication of Soft Multi-Functional Composites, Modelling and Control of Unsteady Locomotion in Fluids, Environmental Studies.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

Doctor of Philosophy in Mechanical Engineering, 2007.

Massachusetts Institute of Technology, Cambridge, MA

Master of Science in Mechanical Engineering, 2001.

Massachusetts Institute of Technology, Cambridge, MA

Bachelor of Science in Mechanical Engineering, 1999.

PROFESSIONAL EXPERIENCE

Singapore University of Technology and Design, Singapore

September 2015 - Present. Assistant Professor.

Massachusetts Institute of Technology., Cambridge, MA

March 2007 - Present. Research Affiliate.

Singapore-MIT Alliance for Research and Technology., Singapore & Cambridge, MA

September 2015 - Present. Research Affiliate.

June - August 2015. Principal Research Scientist.

September 2010 - May 2015. Research Scientist.

Nomadron Inc., Cambridge, MA

January - December 2010. VP of Mechatronic Systems.

Energid Technologies., Cambridge, MA

January - August 2010. Principal Robotic Systems Engineer.

February 2007 - December 2009. Senior Robotic Systems Engineer.

Alpine Pharmaceuticals Inc., Boston, MA

August 2002 - June 2006. Design consultant.

Schlumberger Ltd., Cambridge UK, Ridgefield CT, Rosharon TX

June - August 2000. Robotics intern (Cambridge UK Research Center).

June 1999 - January 2000. Robotics Intern (Doll Research Center).

June - August 1997, 1998: Intern (Schlumberger Perforating and Testing).

TEACHING EXPERIENCE

Singapore University of Technology and Design, Singapore

Engineering Design Innovation (30.007): Spring 2018, Spring 2019, Spring 2020. Lead Instructor, 3 cohorts.

Engineering Design & Project Engineering (30.007): Spring 2016, Spring 2017. Instructor, 3 cohorts.

Introduction to Design (3.007): Fall 2016, Fall 2017, Fall 2018. Instructor, 1 cohort.

Modelling the Systems World (10.007): Spring 2017. Instructor, 1 cohort.

Physics 1 (10.002): Summer 2016: Instructor, 1 cohort.

MIT Mechanical Engineering Department, Cambridge, MA

Spring 2012: Guest Recitation Instructor for *Dynamics and Control I* (2.003J), 30 students.

Fall 2006: Teaching Assistant for *Advanced System Dynamics and Controls* (2.151), 30 students.

Fall 2004, 2002, 2001, 2000: Teaching Assistant for *Elements of Mechanical Design* (2.72), 50 students.

Spring 2000: Teaching Assistant for *System Dynamics and Control* (2.004), 100 students.

STUDENTS ADVISED

Graduate Thesis

- Arturo Castillo Ugalde Ph.D. Mechanical Engineering (SUTD), 2025 (expected).
Stalin Thileepan Ph.D. Mechanical Engineering (SUTD), 2024 (expected).
Plamootil Mathai Aby Raj Ph.D. Mechanical Engineering (SUTD), 2024 (expected).
Li Guangtong Ph.D. Mechanical Engineering (SUTD), 2021 (expected).
Dontu Saikrishna M.Eng. Mechanical Engineering (SUTD), 2021 (expected).
Gumawang Hiramandala M.Eng. Mechanical Engineering (SUTD), 2021 (expected).
Tan Jun Wei Brandon M.Eng. Mechanical Engineering (SUTD), 2020 (expected).
Audren Cloitre M.S. Mechanical Engineering, 2013. Ph.D. Mechanical Engineering (MIT), 2019.
Shien Yang Lee M.S. Mechanical Engineering (SUTD/MIT), 2018.

Undergraduate Thesis

- Sean Mellott B.S. Mechanical Engineering (MIT), 2009.
Anirban Mazumdar B.S. Mechanical Engineering (MIT), 2007.
Adam Kaczmarek B.S. Mechanical Engineering (MIT), 2006.

Undergraduate Research Projects

- Chai Chi Yee, Alysia (ID 1003818) SAUVC (SUTD) 2019.
Ng Chao Yong (ID 1003722) SAUVC (SUTD) 2019.
Nguyen Hoai Nam (ID 1003754) SAUVC (SUTD) 2019.
Edna Chah Eu Myin (ID 1003588) SAUVC (SUTD) 2019.
Ryan Joseph Reganit Sacatani (ID 1003477) SAUVC (SUTD) 2019.
David Fan (ID 1003731) SAUVC (SUTD) 2019.
Tey Shi Ying (ID 1003829) SAUVC (SUTD) 2019.
Bryan Kong Shin Fai (ID 1003387) SAUVC (SUTD) 2019.
Chen Yi B.E. Engineering and Product Development (SUTD), 2018.
Suhasini Padmanathan B.E. Engineering and Product Development (SUTD), 2017.
Lok Weng Ho Howard B.E. Engineering and Product Development (SUTD), 2016.
Grace Kane B.S. Mechanical Engineering (MIT), 2011.
Bonnie Blackburn B.S. Mechanical Engineering (MIT), 2011.
Stephanie Chin Steele B.S. Mechanical Engineering (MIT), 2010.
Winston Larson B.S. Mechanical Engineering (MIT), 2010.
Fiona Yuen B.S. Mechanical Engineering (MIT), 2009.

PUBLICATIONS

Books and Book Chapters:

2. V. Subramaniam, **P. Valdivia y Alvarado** and G. Weymouth, "Sensing on Robots Inspired by Nature". In *Biomimetic Microsensors Inspired by Marine Life.*, pp: 77-110, Springer, 2017. DOI: 10.1007/978-3-319-47500-4_4.
1. **P. Valdivia y Alvarado** and Kamal Youcef-Toumi, "Soft-Body Robot Fish". In *Robot Fish: Bio-inspired Fishlike Underwater Robots.* (ed. R. Du, Z. Li, K. Youcef-Toumi, and P. Valdivia y Alvarado), Springer, 2015. DOI:10.1007/978-3-662-46870-8_6

Refereed Journal Articles:

25. R.C. Mysa and **P. Valdivia y Alvarado**, "The effect of batoid inspired undulating motions on the propulsive forces of a circular planform", *Physics of Fluids*, *Under Review*.
24. S. Vafakhah, M. Saeedikhani, S. Huang, D. Yan, Z.Y. Leong, Y. Wang, L. Hou, L. Guo, **P. Valdivia y Alvarado**, H.Y. Yang, "Tungsten Disulfide-reduced GO/CNT Aerogel: A Tuned Interlayer Spacing Anode for Efficient Water Desalination", *Journal of Materials Chemistry A*, *Under Review*.
23. H. Yang, J. Li, K.Z. Lim, C. Pan, T.V. Truong, Q. Wang, K. Li, S. Li, M. Ding, X. Liu, Q. Xie, **P. Valdivia y Alvarado**, X Wang, P.Y. Chen, "Automatic Strain Sensor Design via Active Learning and Data Augmentation for Soft Machines", *Nature Machine Intelligence*, *Under Review*.

22. L. Guo, J. Zhang, M. Ding, C. Gu, S. Vafakhah, D.S. Li, **P. Valdivia y Alvarado**, H.Y. Yang, “Hierarchical Co3O4/CNT Decorated Electrospun Hollow Nanofiber for Efficient Hybrid Capacitive Deionization”, *ACS Applied Materials & Interfaces*, *Under Review*.
21. V.S. Joseph, T. Calais, T. Stalin, S. Jain, N.K. Thanigaivel, N.D. Sanandiya, **P. Valdivia y Alvarado**, “Silicone/Epoxy Hybrid Resins with Tunable Mechanical and Interfacial Properties for Additive Manufacture of Soft Robots”, *Applied Materials Today*, Volume 22, 2021, 100979, DOI: 10.1016/j.apmt.2021.100979.
20. S. Lakkam, R.C. Mysa, B.T. Balamurali, J.M. Chen, R. Bouffanais, **P. Valdivia y Alvarado**, “Estimating motion parameters of an oscillating flexible hydrofoil using artificial neural networks”, *Physical Review Fluids*, *Under Review*.
19. T. Stalin, S. Jain, N.K. Thanigaivel, J.E.M. Teoh, A.R. Plamootil Mathai, **P. Valdivia y Alvarado**, “Automated Fiber Embedding for Soft Mechatronic Components”, *IEEE Robotics and Automation Letters (RA-L)*, *Accepted*.
18. L. Jing, L.Y. Hsiao, S. Li, H. Yang, P.L.P. Ng, M. Ding, T.V. Truong, S. Gao, K. Li, Y. Guo, **P. Valdivia y Alvarado**, P.Y. Chen, “2D Material-Integrated Hydrogels as Multifunctional Protective Skins for Soft Robots”, *Advanced Science*, *Under Review*.
17. J.H. Low, P.M. Khin, Q.Q. Han, H. Yao, S. Li, Y.S. Teoh, Y. Zeng, **P. Valdivia y Alvarado**, I.M. Cheng, B.C.K. Tee, C.H. Yeow, “Sensorized Reconfigurable Soft Robotic Gripper System for Automated Food Handling”, *IEEE Transactions on Mechatronics*, *Under Review*.
16. L. Guo, M. Ding, D. Yan, M.E. Pam, S. Vafakhah, C. Gu, W. Zhang, **P. Valdivia y Alvarado**, Y. Shi, H.Y. Yang, “High speed capacitive deionization system with flow-through electrodes”, *Desalination*, Volume 496, 2020, 114750, DOI: 10.1016/j.desal.2020.114750.
15. D. Kong, Y. Wang, S. Huang, B. Zhang, Y. V. Lim, G. J. Sim, **P. Valdivia y Alvarado**, Q. Ge, and H. Y. Yang, “3D Printed Compressible Quasi-Solid-State Nickel-Iron Battery”, *ACS Nano* 2020, 14, 8, 9675-9686, DOI: 10.1021/acsnano.0c01157.
14. J. Zhang, X. Li, S. Fan, S. Huang, D. Yan, L. Liu, **P. Valdivia y Alvarado**, H.Y. Yang, “3D-Printed Functional Electrodes towards Zn-Air Batteries”, *Materials Today Energy*, DOI: 10.1016/j.mtener.2020.100407.
13. S. Jain, T. Stalin, E. Kanhere, and **P. Valdivia y Alvarado**, “Flexible Fiber Interconnects For Soft Mechatronics”, *IEEE Robotics and Automation Letters*, 5 (3), 3907-3914, 2020, DOI: 10.1109/LRA.2020.2982367.
12. Y. Wang, C. Shu, T.G. Wang, and **P. Valdivia y Alvarado**, “A generalized minimal residual method-based immersed boundary-lattice Boltzmann flux solver coupled with finite element method for non-linear fluid-structure interaction problems”, *Physics of Fluids*, 2019, DOI: 10.1063/1.5119205.
11. T. Calais, and **P. Valdivia y Alvarado**, “Advanced Functional Materials for Soft Robotics: Tuning Physicochemical Properties beyond Rigidity Control”, *Multi-Functional Materials*, 2019, DOI: 10.1088/2399-7532/ab4f9d.
10. C. Yuan, K. Kowsari, S. Panjwani, Z. Chen, D. Wang, B. Zhang, C. Ng, **P. Valdivia y Alvarado**, and Q. Ge, “Ultrafast three-dimensional printing of optically smooth microlens arrays by oscillation assisted digital light processing”, *ACS Applied Materials & Interfaces* 2019, DOI: 10.1021/acсами.9b14692.
9. S. Vafakhah, X. Li, G. Sim Joey, M. Saeedikhani, **P. Valdivia y Alvarado**, and H.Y. Yang, “3D Printed Electrodes for Efficient Membrane Capacitive Deionization”, *Nanoscale Advances*, DOI: 10.1039/c9na00507b.

8. V. Subramaniam, S. Jain, J. Agarwal, and **P. Valdivia y Alvarado**, “Design and Characterization of a Hybrid Soft Gripper with Active Palm Pose Control”, *International Journal of Robotics Research*. Doi: 10.1177/0278364920918918
7. D. Kong, Y. Wang, S. Huang, Y. V. Lim, L. Sun, J. Zhang, T. Chen, B. Liu, **P. Valdivia y Alvarado**, and H. Y. Yang, “Surface modification of Na₂Ti₃O₇ nanofibre arrays using N-doped graphene quantum dots as advanced anodes for sodium-ion batteries with ultra-stable and high-rate capability”, *J. Mater. Chem. A*, 2019, DOI: 10.1039/C9TA01641D.
6. F. Fries, S.K.H. Win, E. Tang, J.E. Low, L.S.T. Win, **P. Valdivia y Alvarado**, and S. Foong, “Design and Implementation of a Compact Rotational Speed and Air Flow Sensor for Unmanned Aerial Vehicles”, *IEEE SENSORS*, 2019, DOI:10.1109/JSEN.2019.2931002.
5. S.M. Dash, M.S. Triantafyllou, and **P. Valdivia y Alvarado**, “A numerical study on the enhanced drag reduction and wake regime control of a square cylinder using dual splitter plates”, *Computers and Fluids*. DOI:10.1016/j.compfluid.2019.104421.
4. M. Asadnia, A.G.P. Kottapalli, A. Cloitre, **P. Valdivia Y Alvarado**, J. Miao, and M. Triantafyllou, “MEMS sensors for assessing flow-related control of an underwater biomimetic robotic stingray”, *Bioinspiration and Biomimetics*, **10**(3), 036008, 2015. DOI: 10.1088/1748-3190/10/3/036008.
3. B. Epps, **P. Valdivia y Alvarado**, K. Youcef-Toumi, and A. Techet, “Swimming Performance of a Biomimetic Compliant Fish-like Robot”, *Experiments in Fluids*, **47**(6), pp:927-939, 2009. DOI: 10.1007/s00348-009-0684-8.
2. Y.J. Lim, **P. Valdivia y Alvarado**, C.Y. Chang, and N. Tardella, “MR Fluid Haptic System for Regional Anesthesia Training Simulation”, *Stud. Health Technol. Inform.* **132**, pp:248-253, 2008. PMID: 18391297.
1. **P. Valdivia y Alvarado**, and K. Youcef-Toumi, “Design of Machines with Compliant Bodies for Biomimetic Locomotion in Liquid Environments”, *ASME Journal of Dynamics Systems Measurement and Control*, **128**, pp:3-13, 2006. DOI: 10.1115/1.2168476.

Refereed Conference Papers:

30. T.V. Truong, R.C. Mysa, T. Stalin, P.M. Aby Raj, and **P. Valdivia y Alvarado**, “Development of a Maneuverable Un-Tethered Multi-n Soft Robot”, *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, La Vegas, NV, USA, Oct. 25-29 2020.
29. J.E.M. Teoh, R.C. Mysa, T.V. Truong, and **P. Valdivia y Alvarado**, “Propulsive performance of an undulating fin soft robot”, *Global OCEANS 2020: Singapore U.S. Gulf Coast*. October 5-14, 2020.
28. S. Jain, T. Stalin, V. Subramaniam, J. Agarwal, and **P. Valdivia Y Alvarado**, “A Soft Gripper with Retractable Nails for Advanced Grasping and Manipulation”, *IEEE International Conference on Robotics and Automation (ICRA)*, Paris, France, 2020.
27. S. Jain, T. Stalin, E. Kanhere, and **P. Valdivia y Alvarado**, “Flexible Fiber Interconnects For Soft Mechatronics”, *IEEE International Conference on Soft Robotics (RoboSoft)*, 2020.
26. V.T. Truong, V.K. Viswanathan, V. Joseph, and **P. Valdivia y Alvarado**, “Design and Characterization of a Fully Autonomous Under-actuated Soft Batoid-like Robot”, *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, November 4-8, Macau, China 2019.
25. T. Calais, T. Stalin, V. S. Joseph, and **P. Valdivia y Alvarado**, “DNA Nanotechnologies for the Design of Bio-Inspired Soft Nanocomposites with Reversible Rigidity”, *ASME 2019 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS)*, September 9-11, 2019, Louisville, KY.

24. C. Yogiaman, K. Tracy, O. Ghosh, and **P. Valdivia y Alvarado**, “Patterning Airflow: Qualitative Analysis and Design for Thermal Comfort”, 16th International Building Performance Simulation Association (IBPSA) International Conference and Exhibition BS 2019, 2-4 Sept. Rome, Italy.
23. A. Vaish, S. Y. Lee, **P. Valdivia y Alvarado**, “Mechanical Fourier Transform using an Array of Additively Manufactured Soft Whisker-like Sensors”, IEEE International Conference on Robotics and Automation (ICRA), Montreal, QC, Canada, 2019, pp. 9410-9415. DOI: 10.1109/ICRA.2019.8793957.
22. T. Stalin, N. K. Thanigaivel, V. Joseph, **P. Valdivia y Alvarado**, “Automated Fiber Embedding for Tailoring Mechanical and Functional Properties of Soft Robot Components”, 2nd IEEE International Conference on Soft Robotics (RoboSoft), Seoul, Korea (South), 2019, pp. 762-767. DOI: 10.1109/ROBOSOFT.2019.8722752.
21. C. Yogiaman, K. Tracy, O. Ghosh, and **P. Valdivia y Alvarado**, “Aerodynamic articulation: Re-calibrating micro airflow patterns for thermal comfort”, Texas Society of Architects 79th Annual Convention and Design Expo, Fort Worth, TX, 8-10th November, 2018.
20. A. Vaish, S. Y. Lee, **P. Valdivia y Alvarado**, “Viscosity Control of Pseudo-plastic Polymer Mixtures for Applications in Additive Manufacturing”, Proceedings of 2018 Solid Freeform Fabrication Symposium (SFF Symp 2018), August 13-15, 2018, Austin TX, USA.
19. C. Yogiaman, K. Tracy, O. Ghosh, and **P. Valdivia y Alvarado**, “Patterned flow- Augmenting air movement in urban environments”, 5th S-Arch Conference. Venice, Italy, 22-24th May 2018.
18. A. Agarwal, V. K. Viswanathan, S. Maheshwari, **P. Valdivia y Alvarado**, “Effects of Material Properties on Soft Gripper Grasping Forces”, IEEE International Conference on Soft Robotics (RoboSoft), Livorno, 2018, pp. 437-442. DOI: 10.1109/ROBOSOFT.2018.8405365.
17. F. Fries and **P. Valdivia y Alvarado**, “Whisker-like Sensors with Soft Resistive Follicles”, IEEE International Conference on Robotics and Biomimetics (ROBIO), Macau, 2017, pp. 2038-2043. DOI: 10.1109/ROBIO.2017.8324719.
16. V. Viswanathan, H. Jiang, J.H.A. Ng, G.H. Ng, Z.K. Ng, H.E.K. Teo, and **P. Valdivia y Alvarado**, “Adaptation of Batoid-like Propulsion to AUVs and its Performance Analysis”, Proc. IASTED International Conference on Intelligent Systems and Robotics (ISAR), October 6-8, 2016, Zurich, Switzerland.
15. M. Asadnia, J. Miao, A.G.P. Kottapalli, **P. Valdivia Y Alvarado**, and M. Triantafyllou, “Self-Powered Micro-sensors to Improve Control and Maneuvering of a Robotic Stingray”, SENSORS, 2014 IEEE, Valencia, 2014, pp. 458-461. DOI: 10.1109/ICSENS.2014.6985034.
14. K. S. Sekar, M. Triantafyllou, and **P. Valdivia y Alvarado**, “Flapping Actuator Inspired by Lepidotrichia of Ray-Finned Fishes”, IEEE/RSJ International Conference on Intelligent Robots and Systems, Chicago, IL, 2014, pp. 1120-1126. DOI: 10.1109/IROS.2014.6942698.
13. A. Cloitre, B. Arensen, N. Patrikalakis, K. Youcef-Toumi, and **P. Valdivia y Alvarado**, “Propulsive Performance of an Underwater Soft Biomimetic Batoid Robot”, Proc. the 24th International Ocean and Polar Engineering Conference (ISOPE), Busan, Korea, Jun. 2014.
12. **P. Valdivia y Alvarado**, and S. Bhat, “Whisker-like sensors with tunable follicle sinus complex for underwater applications”, Proc. of SPIE Bioinspiration, Biomimetics, and Bioreplication IV conference, March 9-12, 2014, San Diego, CA, USA.
11. **P. Valdivia y Alvarado**, V. Subramaniam, and M. Triantafyllou, “Performance Analysis and Characterization of Bio-Inspired Whisker Sensors for Underwater Applications”, IEEE/RSJ International Conference on Intelligent Robots and Systems, Tokyo, 2013, pp. 5956-5961. DOI: 10.1109/IROS.2013.6697220.

10. A. Cloitre, V. Subramaniam, N. Patrikalakis, and **P. Valdivia y Alvarado**, “Design and Control of a Field Deployable Batoid Robot”, 4th IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob), Rome, 2012, pp. 707-712. DOI: 10.1109/BioRob.2012.6290739.
9. **P. Valdivia y Alvarado**, “Hydrodynamic Performance of a Soft Body Under-actuated Batoid Robot”, IEEE International Conference on Robotics and Biomimetics, Karon Beach, Phuket, 2011, pp. 1712-1717. DOI: 10.1109/ROBIO.2011.6181536.
8. H. Hans, J. Miao, **P. Valdivia y Alvarado**, and M. Triantafyllou, “Chemical Composition and Physical Features of Harbor Seal (*Phoca Vitulina*) Vibrissae for Underwater Sensing Applications”, IEEE International Conference on Robotics and Biomimetics, Karon Beach, Phuket, 2011, pp. 1439-1443. DOI: 10.1109/ROBIO.2011.6181492.
7. **P. Valdivia y Alvarado**, S. Chin, W. Larson, A. Mazumdar, and K. Youcef-Toumi, “A Soft Body Under-actuated Approach to Multi Degree of Freedom Biomimetic Robots: A stingray example”, 3rd IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechatronics, Tokyo, 2010, pp. 473-478. DOI: 10.1109/BIOROB.2010.5627803.
6. **P. Valdivia y Alvarado**, C.Y. Chang, and K. Hynynen, “Design of a Manipulator System for Hemorrhage Detection and Treatment using High Intensity Focused Ultrasound (HIFU)”, IEEE/RSJ International Conference on Intelligent Robots and Systems, St. Louis, MO, 2009, pp. 4529-4534. DOI: 10.1109/IROS.2009.5354215.
5. Y.J. Lim, T. Le, **P. Valdivia y Alvarado**, C.Y. Chang, and N. Tardella, “A Regional Anesthesia Training Simulation System”, Proceedings of Medicine Meets Virtual Reality (MMVR) 17, Long Beach, CA., Jan, 2009.
4. Y.J. Lim, T. Le, **P. Valdivia y Alvarado**, N. Tardella, and K. Curley, “Simulation-Based Military Regional Anesthesia Training System”, 26th Army Science Conference, Orlando, FL, December, 2008.
3. A. Mazumdar, **P. Valdivia y Alvarado**, and K. Youcef-Toumi, “Maneuverability of a Robotic Tuna with Compliant Body”, IEEE International Conference on Robotics and Automation, Pasadena, CA, 2008, pp. 683-688. DOI: 10.1109/ROBOT.2008.4543284.
2. **P. Valdivia y Alvarado**, and K. Youcef-Toumi, “Performance of machines with flexible bodies designed for biomimetic locomotion in liquid environments”, Proceedings of the 2005 IEEE International Conference on Robotics and Automation, Barcelona, Spain, 2005, pp. 3324-3329. DOI: 10.1109/ROBOT.2005.1570623.
1. **P. Valdivia y Alvarado**, and K. Youcef-Toumi, “Modeling and design methodology for an efficient underwater propulsion system”, Proc. IASTED International conference on Robotics and Applications, 2003, pp:161-166, Salzburg, Austria.

Contributed Papers and Abstracts:

17. R. C. Mysa, and **P. Valdivia y Alvarado**, “Numerical analysis of the force generation mechanism in a stingray inspired circular plan-forms”, *Bulletin of the American Physical Society DFD 72*, 2019.
16. R. C. Mysa, and **P. Valdivia y Alvarado**, “The role of edge curvature on the thrust force in a stingray inspired plan-form”, *Bulletin of the American Physical Society DFD 72*, 2019.
15. T.V. Truong, V.S. Joseph, and **P. Valdivia y Alvarado**, “Effects of fin kinematics on 3D force generation in underwater large pectoral fin locomotion”, Proceedings the 9th International Symposium on Adaptive Motion of Animals and Machines (AMAM), EPFL, Lausanne, August 20-23, 2019.

14. T. Calais, T. Stalin, V.S. Joseph, **P. Valdivia y Alvarado**, “Bio-Inspired Stretchable Materials with Reversible Rigidity for Soft Robotics Applications”, 10th International Conference on Materials for Advanced Technologies (ICMAT) 23-28 June 2019, Marina Bay Sands, Singapore.
13. N. Boddeti, O. Weeger, **P. Valdivia y Alvarado**, M. Dunn, “Optimal Design of Bio-inspired Multi-material Soft Robots”, Symposium on Advances in Modeling and Simulation of Soft Robots and Realization of Technical Applications, 13th World Congress in Computational Mechanics (WCCM2018) July 22-27 2018, New York NY, USA.
12. **P. Valdivia y Alvarado**, “Direct Fabrication and tailoring of Soft Robot Bodies”, Multifunctional Materials and Structures, Gordon Research Conference, January 14-19 2018, Ventura CA, USA.
11. S. M. Dash, M. Triantafyllou, and **P. Valdivia y Alvarado**, “Control of wake vortex street behind a square cylinder using surface traveling waves”, *Bulletin of the American Physical Society DFD* 70, 2017.
10. **P. Valdivia y Alvarado** and K.S. Sekar, “Effects of Deformation Kinematics on Underwater Fin Locomotion”, Proceedings of the 7th Symposium on Adaptive Motion of Animals and Machines AMAM 2015, June 21-25, Cambridge MA, USA.
9. **P. Valdivia y Alvarado**, “Modeling and Control of Soft Body Underwater Fin Locomotion”, ICRA 2015 Workshop on Soft Robotics: Actuation, Integration, and Applications, May 30 2015.
8. M. Asadnia, J. Miao, A.G.P. Kottapalli, **P. Valdivia Y Alvarado**, and M. Triantafyllou, “Self-powered Micro-sensors to Improve Control and Maneuvering of a Robotic Stingray”, Proc. IEEE SENSORS, Nov. 2014, pp:458-461, Valencia, Spain.
7. **P. Valdivia y Alvarado**, S. Bhat, and K. Sekar, “Soft Tunable Whisker-like Sensors”, Workshop on Advances on Soft Robotics, Robotics Science and Systems (RSS) Conference, July 13, 2014, Berkeley CA.
6. **P. Valdivia y Alvarado**, K. Srivatsa, and M. Triantafyllou, “A Simple Analytical Model for Batoid Wakes and Thrust”, *Bulletin of the American Physical Society DFD* 58, 2013.
5. **P. Valdivia y Alvarado**, V. Subramaniam, and M. Triantafyllou, “Design of a Bio-Inspired Whisker Sensor for Underwater Applications”, Proc. IEEE SENSORS, Oct. 2012, pp:1-4, Taipei, Taiwan.
4. N. Patrikalakis, G. Weymouth, H. Kurniawati, **P. Valdivia y Alvarado**, T. Taher, R. Khan, J.C. Leighton, and G. Papadopoulos, “Modeling and Inspection Applications of a Coastal Distributed Autonomous Sensor Network”, Proc. of the ASME 31st International Conference on Ocean, Offshore, and Arctic Engineering (OMAE), Jul. 2012, pp:319-325, Rio de Janeiro, Brazil.
3. **P. Valdivia y Alvarado**, G. Weymouth, D. Thekoodan, and N. Patrikalakis, “Wake topology of under-actuated rajiform batoid robots”, *Bulletin of the American Physical Society DFD* 56, 2011.
2. H. Hans, **P. Valdivia y Alvarado**, D. Thekoodan, M. Jianmin, and M. Triantafyllou, “A whisker sensor: role of geometry and boundary conditions”, *Bulletin of the American Physical Society* 56, 2011.
1. **P. Valdivia y Alvarado**, T. Taher, H. Kurniawati, G. Weymouth, R.R. Khan, J. Leighton, G. Papadopoulos, G. Barbastathis, and N. Patrikalakis, “A Coastal Distributed Autonomous Sensor Network”, Proc. MTS/IEEE OCEANS’11, Sept. 2011, pp:1-8, Kona, Hawaii.

PERFORMANCE INDICATORS

- Total Citations (Google Scholar): 2054
- Hirsch Index (Google Scholar): 21

INVITED TALKS

27. “Human-Centered, Bio-Inspired Design”, Engineers without Borders (EWB) Seminar, Newcastle University, UK, February 10, 2021.
26. “Direct Fabrication and Tailoring of Soft Robot Bodies”, Institute for Robotics and Intelligent Machines (IRIM) Seminar, Georgia Tech, February 3, 2021.
25. “Soft Robotics - Science & Applications”, PSA Innovation Week Workshop, October 26 - 30, 2020, Singapore.
24. “Soft Robots and Sensors for Marine Applications”, Sea Grant Collaborative Networks Panel II: Reaching beyond Massachusetts with regional, national, and global collaborations, May 1st, 2019, Cambridge, MA, USA.
23. “Three Fabrication Processes for Applications in Aquatic Soft Robots”, Workshop on Aquatic Soft Robots. IEEE ROBOSOFT April 14 2019, COEX, Seoul, Korea.
22. “Design and Optimisation of Soft Robots ”, International Conference for Leading and Young Computer Scientists (IC-LYCS), March 2, 2019, Okinawa, Japan.
21. “Design and Fabrication of Tailored Soft Robots”, The Helmholtz Graduate School for Macromolecular Bioscience Summer School, Helmholtz-Zentrum Geesthacht, September 25, 2018, Teltow, Germany.
20. “Fluid Vision”, Workshop on Active Touch for Perception and Interaction: How Nature Inspires Robotics, IEEE International Conference on Robotics and Automation (ICRA), May 25, 2018.
19. “Bio-inspired soft whisker-like sensors”, Workshop on Fluid-Driven Soft Robots, IEEE-RAS International Conference on Soft Robotics (RoboSoft), April 24, 2018.
18. “Opportunities and Challenges for Soft Robotics in Marine Exploration”, International Marine Contractors Association - IMCA, ROV Seminar, November 28, 2017.
17. “New Soft Robot Technologies and their Potential Environmental Applications”, Center for Environmental Sensing and Modelling (CENSAM) Annual Workshop, June 30, 2017.
16. “Opportunities and Challenges for Small-scale Soft Robots and Potential Applications to Bio-hybrid Machines”, Workshop on Biohybrid Machine by Small-scale Robotics and Systems, IEEE International Conference on Robotics and Automation (ICRA), June 2, 2017.
15. “Direct Fabrication of Soft Robot Bodies as Functionalized Soft Composite Structures”, Workshop on Advanced Fabrication and Morphological Computation for Soft Robotics, IEEE International Conference on Robotics and Automation (ICRA), May 29, 2017.
14. “Machine Life” Keynote Talk, ArtScience Programme IDEA 2016, St. Joseph’s Institution, May 27 2016.
13. “Soft Robots and Sensors for Various Marine Applications”, Society for Underwater Technology (SUT) Technical Meeting, May 26 2016.
12. “Modelling and Control of Soft Body Underwater Fin Locomotion”, IEEE Ocean Engineering Society (OES) Workshop, October 9 2015.
11. “Under-actuated Soft Robots and Sensors”, EPD Distinguished Lectures Series, Singapore University of Technology and Design, April 22 2015.
10. “Under-actuated Soft Robots and Sensors for Marine Applications”, Coastal and Ocean Fluid Dynamics group (COFDL) Seminar, Woods Hole Oceanographic Institution, September 12 2014.

9. “Design of Soft Robots and Sensors”, Mechanical Engineering Departmental Seminar, U. Mass, Amherst, September 8 2014.
8. “Models for Bio-inspired Unsteady Fin Locomotion and Sensing in Fluid Environments”, Controls Instrumentation and Robotics (CIR) Seminar, Mechanical Engineering Department, MIT, September 4 2014.
7. “Multi-functional Field Robotic Devices: Vehicles and Sensors”, Mechanical Engineering Seminar, Stony Brook University, April 25, 2014.
6. “New Technologies for Ocean Observation and Monitoring”, Maritime and Science Innovation Workshop, Singapore July 3 2013.
5. “Making Better Robots”, National University of Singapore, Ignite talks, February 6 2013.
4. “Underwater Biomimetic Sensing”, IEEE OES-TMSI Workshop, Nov. 2012.
3. “Vehicles and Sensors for a Robust Coastal Distributed Autonomous Sensor Network”, Temasek Laboratories, Oct. 2011.
2. “A Coastal Distributed Autonomous Sensor Network”, Project STARFISH: 6th Workshop on Autonomous Underwater Vehicles, National University of Singapore, Aug. 2011.
1. “A Soft Body Under-actuated Approach to Multi-Degree of Freedom Biomimetic Robots”, Keynote talk for 3rd International Conference on Underwater System Technology, USYS '10, Cyberjaya, Malaysia, Nov. 2010.

HONORS AND AWARDS

- Cities of Love Award (COLA), Sustainability Special Mention for “Dynamic Soft Facade for Active Air Flow Control (SFAAC)” (2020).
- Asia Pacific Society for Computing and Information Technology Award for Outstanding Research Achievements and Contributions for “Design and Optimization of Soft Robots (International Conference for Leading and Young Computer Scientists IC-LYCS, 2019).
- Cities of Love Award (COLA), A recognition for ground-up sustainability, for work on “Passive Soft-Robots for Long-Term Marine Pollution Studies” (2018).
- Winner of MIT’s Technology Review 2012 TR35 Young Innovator Award for South East Asia, Australia and New Zealand for work on soft robots for long-term exploration of harsh environments.
- Design of biomimetic compliant devices (my doctoral work) featured in the permanent exhibition, “A Journey Through Creativity”, at the ARTSCIENCE Museum in Singapore.
- Finalist, Best Conference Paper, IEEE Robotics and Biomimetics (ROBIO) 2011: **P. Valdivia y Alvarado**, “Hydrodynamic Performance of a Soft Body Under-actuated Batoid Robot”.

PATENTS

34. Artificial cervical and lumbar discs, disc plate insertion gun for performing sequential single plate intervertebral implantation enabling symmetric bi-disc plate alignment for interplate mobile core placement, US Patent 10,610,371, Issued Apr. 7 2020.
33. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs having a central screw locking lever, and pliers and devices for spinal fusion, US Patent 10,603,183, Issued Mar. 31 2020.
32. Bidirectional fixating intervertebral implant system, US Patent 10,537,442, Issued on Jan. 21 2020.

31. Tension based automated extrusion, layering, and embedding of long continuous fibers. PCT application number PCT/SG2020/050219, Submitted on 9 April 2020.
30. Soft Gripper. IPOS Application Number 10202001712Q, Submitted on 26th February 2020.
29. System with tool assembly and expandable spinal implant. US Patent No. 10,478,319, Issued on Nov. 11 2019.
28. Zero-profile expandable intervertebral spacer devices for distraction and spinal fusion and a universal tool for their placement and expansion. US Patent No. 10,426,633, Issued on Oct. 1st 2019.
27. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 10,390,969, Issued on Aug. 27 2019.
26. Spinal Staple. US Patent No. 10,376,386, Issued on Aug. 13 2019.
25. Artificial cervical and lumbar discs, disc plate insertion gun for performing sequential single plate intervertebral implantation enabling symmetric bi-disc plate alignment for interplate mobile core placement. US Patent No. 10,376,376, Issued on Aug. 13 2019.
24. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs. US Patent No. 10,376,383, Issued on Aug. 13 2019.
23. Artificial cervical and lumbar discs, disc plate insertion gun for performing sequential single plate intervertebral implantation enabling symmetric bi-disc plate alignment for interplate mobile core placement. US Patent No. 10,369,003, Issued on Aug. 6 2019.
22. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 9,895,238, Issued on Feb. 20 2018.
21. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 9,889,022, Issued on Feb. 13 2018.
20. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 9,867,719, Issued on Jan. 16 2018.
19. Artificial cervical and lumbar discs, disc plate insertion gun for performing sequential single plate intervertebral implantation enabling symmetric bi-disc plate alignment for interplate mobile core placement. US Patent No. 9,867,712, Issued Jan. 16 2018.
18. Zero-profile expandable intervertebral spacer devices for distraction and spinal fusion and a universal tool for their placement and expansion. US Patent No. 9,848,993, Issued Dec. 26 2017.
17. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs. US Patent No. 9,744,052, Issued Aug. 29 2017.
16. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs having a central screw locking lever, and pliers and devices for spinal fusion. US Patent No. 9,622,875, Issued Apr. 18 2017.
15. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs and posterior cervical and lumbar interarticulating joint stapling guns and devices for spinal fusion. US Patent No. 9,603,713, Issued Mar. 28 2017.

14. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs with vertical hemi-bracket screw locking mechanism. US Patent No. 9,532,821, Issued Jan. 3 2017.
13. Flexible robotic manipulation mechanism. US Patent No. 9,357,708, Issued Jun. 7 2016.
12. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 9,301,854, Issued Apr. 5 2016.
11. Artificial cervical and lumbar discs, disc plate insertion gun for performing sequential single plate intervertebral implantation enabling symmetric bi-disc plate alignment for interplate mobile core placement. US Patent No. 9,056,018, Issued Jun. 16 2015.
10. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 9,005,293, Issued Apr. 14 2015.
9. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs having a central screw locking lever, and pliers and devices for spinal fusion. US Patent No. 8,734,516, Issued May 27 2014.
8. Artificial cervical and lumbar discs, disc plate insertion gun for performing sequential single plate intervertebral implantation enabling symmetric bi-disc plate alignment for interplate mobile core placement. US Patent No. 8,535,379, Issued Sept. 17 2013.
7. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US Patent No. 8,353,913, Issued Jan. 15 2013.
6. Posterior cervical and lumbar interarticulating joint staples, stapling guns, and devices for spinal fusion. US Patent No. 8,257,370, Issued Sept. 4 2012.
5. Bi-directional fixating/locking transvertebral body screw/intervertebral cage stand-alone constructs and posterior cervical and lumbar interarticulating joint stapling guns and devices for spinal fusion. US Patent No. 7,972,363, Issued Jul. 5 2011.
4. Bi-directional fixating transvertebral body screws and posterior cervical and lumbar interarticulating joint calibrated stapling devices for spinal fusion. US patent 7,942,903 B2, Issued May 17, 2011.
3. Mechanical fish robot exploiting vibration modes for locomotion. US patent 7,865,268 B2, Issued Jan 4 2011.
2. Applicator. US patent 7,055,528, Issued Jun. 6, 2006.
1. Citrus Harvester U.S.S.N.: 61/126,382 (Provisional US patent application). Filed May 5 2008.

FUNDING

Total: SGD 13,181,161 (SGD 10,467,561 at SUTD)

25. SMI Grant - S\$4,514,460, 30/10/2020 - 29/10/2023, "Mobile Collaborative Robot Platforms with Vision Feedback and Adaptive and Learning Soft End-Effectors for Coning/de-Coning Wharf Operations", (PI).
24. MOE Tier 2 Grant - S\$582,580, 01/2020 - 01/2023, "3D Printed dendrite-free lithium metal battery with automatic shutdown function", (Co-PI).

23. Advanced Re-manufacturing and Technology Centre (ARTC) Grant - S\$12,000, 01/2019 - 06/2019, "Pilot IHI Project", (PI).
22. Agency for Science, Technology and Research (ASTAR), Science and Engineering Research Council (SERC) Grant - S\$1,361,400, 01/2019 - 12/2020, "Soft and Hybrid Robotics Phase 1", (Co-PI).
21. SUTD International Design Centre (IDC), Singapore - S\$72,706, 09/2018 - 02/2019, "Funds to Move Fluid Mechanics Experimental Facilities from SMART", (PI).
20. SUTD International Design Centre (IDC), Singapore - S\$431,600, 07/2018 - 06/2020, "Fluid Vision: Design and Optimization of Soft Whisker-like Sensors", (PI).
19. SUTD Digital Manufacturing and Design (DManD) Centre, Singapore - S\$325,920, 04/2018 - 03/2020, "Structure Optimization and Fabrication of Soft Composites exploiting Fluid Instabilities", (PI).
18. SUTD Digital Manufacturing and Design (DManD) Centre, Singapore - S\$192,000, 04/2018 - 03/2020, "Prototyping of Environmentally Responsive Textile Structures", (Co-PI).
17. MOE AcRF Tier 1 Grant - S\$306,000, 10/2017 - 10/2019, "Hybrid multi-modal and multi-domain swarm robotics solution for pervasive monitoring of marine coastal areas", (Co-PI).
16. Agency for Science, Technology and Research (ASTAR), Science and Engineering Research Council (SERC) Grant - S\$300,000, 06/2017 - 12/2020, "Model Factory @ ARTC", (Co-PI).
15. SUTD Digital Manufacturing and Design (DManD) Centre, Singapore - S\$43,295, 05/2017 - 04/2018, "Hygroscopic Assembly", (Co-PI).
14. Office of Naval Research Global - \$150,000, 08/2016 - 08/2019, "Multi-material soft-active-composite structures", (PI).
13. SUTD International Design Centre (IDC), Singapore - S\$304,660, 08/2016 - 02/2017, "Tools and Equipment for Imaging and Particle Image Velocimetry Studies", (PI).
12. SUTD International Design Centre (IDC), Singapore - S\$500,000, 05/2016 - 05/2019, "Active flow separation control", (PI).
11. SUTD Digital Manufacturing and Design (DManD) Centre, Singapore - S\$708,570, 05/2016 - 05/2019, "Multi-material Adaptive Soft Robots", (PI).
10. SUTD Digital Manufacturing and Design (DManD) Centre, Singapore - S\$412,000, 05/2016 - 05/2019, "Multi-media Rapid Prototyping Hubs", (PI).
9. Temasek Laboratories Temasek@SUTD SEED Research Programme, Singapore - S\$50,290, 04/2016 - 04/2017, "Bio-inspired sensor array to detect and track invisible trails left by vehicles and objects in underwater and aerial environments", (PI).
8. SUTD International Design Centre (IDC), Singapore - S\$100,080, 10/2015 - 09/2018, "Passive Soft-Robots for Long-Term Marine Pollution Studies", (PI).
7. EPD Start up Research Grant, Singapore - S\$100,000, 09/2015 - 09/2018, (PI).
6. DSO National Laboratories, Singapore - S\$160,000, 05/2014 - 05/2015, "Adaptation of batoid-fin technology to AUVs and its performance", (PI).
5. Department of Defense, U.S. Army Medical Research and Materiel Command - \$779,915 (S\$1,060,000), 11/2009 - 11/2011, "Autonomous Airway Management", (PI)
4. Department of Defense, U.S. Army Medical Research and Materiel Command- \$99,999 (S\$136,000), 4/2010 - 11/2010, "Actively Compliant Parallel End-Effector Mechanism for Medical Interventions", (PI).

3. Department of Defense, U.S. Army Medical Research and Materiel Command - \$69,998 (S\$95,000), 2/2009 - 8/2009, "Autonomous Airway Management", (PI).
2. Department of Defense, U.S. Army Medical Research and Materiel Command - \$849,929 (S\$1,154,000), 8/2006 - 1/2009, "Robotic High Intensity Focused Ultrasound (HIFU) Manipulator System for Critical Systems Transport (CSTAT)", (PI).
1. U.S. Department of Agriculture - \$80,000 (S\$108,600), 5/2008 - 12/2009, "Robotic Mass Removal of Citrus Fruits", (PI: J. English).

PUBLICITY

Patterned Flow: Augmenting Air Movement in Urban Environment: ARCHIFEST 2017 (Archi-Interfaces Exhibition); The URA Centre City Gallery 3F City.

Robot fish set to be deployed to rescue sea life: International Business Times, April 21 2015.

Drones of the deep and the skies: Straits Times, March 29 2015.

Whisker-like flow sensors: Featured on Zaoobao, 2013.

Biomimetic Robotic Fish: Featured on: National Geographic Magazine, February 2010; NATURE blogs, 2009; MIT News, Technology Review, VOL 112, No 6. 2009; CNN.com/Technology, August 2009; Discovery Channel, Discovery News, 2009; CNET, 2009; Gizmodo, 2009; WIRED News, 2009; Emerging Technologies (MIT Technology Review) article 2005.

SERVICE ACTIVITIES

- Associate Editor, IOP Journal of Multifunctional Materials (Mar. 2018 - Present).
- Associate Editor, IEEE Robotics and Automation Letters, RA-L (Oct. 2018 - Present).
- Associate Editor, IEEE International Conference on Soft Robotics (RoboSoft).
- Chair (Dec. 2015 - Nov. 2016) EPD Development Committee.
- Chairman (Nov. 2012 to Nov. 2013) and Vice Chairman (Nov. 2011 to Nov. 2012) IEEE Ocean Engineering Society (OES) Singapore Chapter.
- Grant reviewer for the Natural Sciences and Engineering Research Council of Canada (NSERC).
- Grant reviewer for the Helmholtz Association of German Research Centres.
- Member of the Singapore Accreditation Council (SAC) Technical Committee for Electrical and Infocomm Technology (EIT TC) July 2018 to June 2021.
- Technical reviewer for: Soft Robotics; IEEE Robotics and Automation Magazine; Journal of Fluids and Structures; IEEE Transactions on Mechatronics; IEEE Transactions on Aerospace and Electronic Systems; PLOS Computational Biology; IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS); IEEE International Conference on Robotics and Automation (ICRA); IEEE Conference on Decision and Control (CDC).

LANGUAGES: Spanish (Native Proficiency), English (Bilingual Proficiency), French (Bilingual Proficiency), Italian (Limited working proficiency).

PROFESSIONAL AFFILIATIONS: American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronic Engineers (IEEE), American Physical Society (APS), The International Society for Optics and Photonics (SPIE), Materials Research Society (MRS).