Bibliography - Prof Thomas Bewley

PROFILE

Prof Bewley founded and directs the Flow Control & Coordinated Robotics Labs at UC San Diego. The Flow Control Lab investigates a range of questions ranging from fundamental to applied, including the development of advanced analysis tools and numerical methods to better understand, optimize, estimate, forecast, and control fluid systems. The Coordinated Robotics Lab investigates the mobility and coordination of low-cost robotic vehicles, leveraging dynamic models and feedback control, with prototypes built using cellphone and IoT technologies, custom PCBs, and 3D printing. The two labs collaborate closely on a variety of interdisciplinary projects, including the deployment of robotic sensor vehicle swarms for both real-time hurricane measurement as well as real-time contaminant plume detection, estimation, & forecasting.

Prof Bewley also has broad experience **consulting**, and severing as an **expert witness**, on a wide range of engineering problems related to mechanical design, heat transfer, stability, control, optimization, fluid mechanics, structural analysis, robotics, and other special topics related to the research reported herein.

PROFESSIONAL PREPARATION

B.S.	Engineering & Applied Science	Caltech	GPA: 3.9	1989
M.S.	Mechanical Engineering	Caltech	GPA: 3.9	1989
Diploma	Aeronautics/Aerospace	von Karman Institute for Fluid Dynamics	rank: 1/39	1990
Ph.D.	Mechanical Engineering	Stanford	GPA: 4.0	1999

ACADEMIC APPOINTMENTS

Permanent:

Professor	Mechanical & Aerospace Engineering	UC San Diego	July 2009 - present
Affiliate Professor	Computer Science & Engineering	UC San Diego	July 2015 - present
Associate Professor	Mechanical & Aerospace Engineering	UC San Diego	July 2004 - June 2009
Assistant Professor	Mechanical & Aerospace Engineering	UC San Diego	Sep 1998 - June 2004

Temporary:

|		
sabbatical with Patrick Huerre	École Polytechnique, Palaiseau, France	fall 1998
CTR Summer Programs with Parviz Moin	CTR, Stanford	summers 1996/98, 2000/02/08
sabbaticals with Paolo Luchini	Industrial Eng., UNISA, Salerno, Italy	spring 2009 & 2011
Mathematics of Turbulence long program	IPAM, UCLA	fall 2014
Faculty Research Program with Ryan Alimo	JPL, Los Angeles	summer 2019
1.5 month visit with Ali Masheyek	University of Cambridge, UK	late spring 2023
Distinguished Visiting Professor, DFME	United States Air Force Academy (USAFA)	AY 2024-2025
Visiting Prof, working with Flavio Guannetti	Industrial Eng. (DIIN), UNISA, Salerno, Italy	fall 2025

AWARDS

Charles Lee Powell Foundation Faculty Fellowship	2000
Hellman Foundation Faculty Fellowship	2002
ONR Young Investigator	2003
UCSD MAE Best Teacher Award	2013
Innovative Toy Of The Year (the WowWee MiP sold millions of units in its different variations)	2015

PUBLICATIONS

google scholar
6500+ total citations
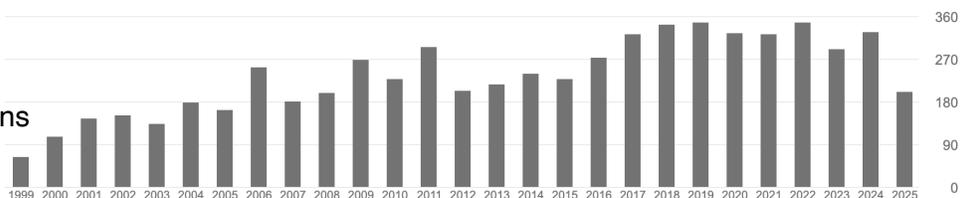
Summarized on the pages that follow:

54 published journal articles, **93** published conference papers, and first author on **6** granted US patents. Additionally: links to: **9** submitted manuscripts on recent work, and **1** international (PCT) patent applied for, as summarized briefly at my corresponding **Personal Statement**.

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Published journal articles, with local, original, and some google scholar hyperlinks

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2. **Bewley, T**, & Liu, S. (1998) Optimal and robust control and estimation of linear paths to transition. *J. Fluid Mech*. **365**, 305-349. (**citations**)

3. Hammond, E.P., **Bewley, T**, & Moin, P. (1998) Observed mechanisms for turbulence attenuation and enhancement in opposition-controlled wall-bounded flows. *Physics of Fluids* **10**, 2421-2423. (**citations**)

4. **Bewley, T** (1999) Linear control and estimation of nonlinear chaotic convection: harnessing the butterfly effect. *Physics Of Fluids* **11** (5), 1169-1186. (**citations**)

5. **Bewley, T**, Temam, R., & Ziane, M. (2000a) A general framework for robust control in fluid mechanics. *Physica D* **138**, 360-392. (**citations**)

6. **Bewley, T**, Temam, R., & Ziane, M. (2000b) Existence and uniqueness of optimal control to the Navier-Stokes equations. *C.R. Acad. Sci. Paris* **330** (11), 1-5. (**citations**)

7. **Bewley, T** (2001) Flow control: new challenges for a new Renaissance. *Progress in Aerospace Sciences* **37**, 21-58. (**citations**)

8. **Bewley, T**, Moin, P., & Temam, R. (2001) DNS-based predictive control of turbulence: an optimal benchmark for feedback algorithms. *J. Fluid Mech*. **447**, 179-225; see also appendix C. (**citations**)

9. Lauga, E., & **Bewley, T** (2002) Modern control of linear global instability in a cylinder wake model. *International Journal of Heat and Fluid Flow* **23**, 671-677. (**citations**)

10. Aamo, O.M., Krstic, M., & **Bewley, T** (2003) Control of mixing by boundary feedback in 2D channel flow. *Automatica* **39**, 1597-1606. (**citations**)

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13. Hogberg, M., **Bewley, T**, & Henningson, D.S. (2003) Relaminarization of Re_tau=100 turbulence using gain scheduling and linear state-feedback control. *Physics Of Fluids* **15**, 3572-3575. (**citations**)

14. Lauga, E., & **Bewley, T** (2003) The decay of stabilizability with Reynolds number in a linear model of spatially developing flows. *Proc. R. Soc. Lond. A* **459**, 2077-2095. (**citations**)

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17. Luo, H., & **Bewley, T** (2004) On the contravariant form of the Navier-Stokes equation in time-dependent curvilinear coordinate systems. *J. Comp. Phys*. **199**, 355-375. (**citations**)

18. **Bewley, T**, & Protas, B. (2004) Skin friction and pressure: the "footprints" of turbulence. *Physica D* **196**, 28-44. (**citations**)

19. Protas, B, **Bewley, T**, & Hagen, G. (2004) A computational framework for the regularization of adjoint analysis in multiscale PDE systems. *J. Comp. Phys*. **195** (1), 49-89. (**citations**)

20. **Bewley, T**, & Aamo, O.M. (2004) A "win-win" mechanism for low-drag transients in controlled 2D channel flow and its implications for sustained drag reduction. *J. Fluid Mech*. **499**, 183-196. (**citations**)

21. Cathalifaud, P., & **Bewley, T** (2004) A noncausal framework for model-based feedback control of spatially-developing perturbations in boundary-layer flow systems. Part I: Formulation. *Systems and Control Letters* **51** (1), 1-13. (**citations**)

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2. **Bewley, T** (1990) Swept fin induced shock wave / laminar boundary layer interactions - an analytical, computational, and experimental study, *von Karman Institute for Fluid Dynamics Project Report 1990-31*, 74 pages.

3. **Bewley, T**, Choi, H, Temam, R, & Moin, P (1993) Optimal feedback control of turbulent channel flow, *CTR Annual Research Briefs*. Stanford. (**citations**)

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8. **Bewley, T**, Moin, P, & Temam, R (1997) Optimal and robust approaches for linear and nonlinear regulation problems in fluid mechanics, *AIAA Paper 1997-1872*, Snowmass. (**citations**)

9. Temam, R., **Bewley, T**, & Moin, P. (1997) Control of turbulent flows, *18th IFIP TC7 Conference on System Modelling and Optimization*, Detroit. (**citations**)

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11. Koumoutsakos, P., **Bewley, T**, Hammond, E., & Moin, P. (1997) Feedback algorithms for turbulence control - Some recent developments, *AIAA Paper 1997-2008*, Snowmass.

12. Cain, AB, **Bewley, T**, Freund, JB, & Colonius, T (1998) An approach to systems modeling for real-time control of jet flows, *Proc. of the CTR Summer Program*, 133-139. Stanford.

13. **Bewley, T** (1999) On the applicability of linear feedback for nonlinear systems in fluid mechanics, *ACC*, San Diego.

14. **Bewley, T** (1999) New Frontiers for Control in Fluid Mechanics: A Renaissance approach, *ASME/JSME Joint Fluids Engineering Conference, FEDSM99-6926*. San Francisco.

15. Hogberg, M., & **Bewley, T** (2000) Spatially-localized convolution kernels for feedback control of transitional flows, *CDC*, Sydney.

16. Baggett, JS, Nicoud, F, Mohammadi, B, **Bewley, T**, Gullbrand, J, & Botella, O (2000) Sub-optimal control based wall models for LES–including transpiration velocity, *Proc. of the CTR Summer Program*, 331-342. Stanford.

17. Aamo, OM, Krstic, M, & **Bewley, T** (2001) Fluid mixing by feedback in Poiseuille flow, *ACC*, Arlington.

18. Cervino, LI, **Bewley, T**, Freund, JB, & Lele, SK (2002) Perturbation and adjoint analyses of flow-acoustic interactions in an unsteady 2D jet, *Proc. of the CTR Summer Program*, 27-40. Stanford. (**citations**)

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19. Blossey, PN, Narayanan, S, & **Bewley, T** (2002) Dynamics & Control of Jets in Crossflow: Direct numerical simulations & experiments, *IUTAM Symposium on Turbulent Mixing and Combustion*, 45-57. Kingston, Ontario.

20. Lauga, E, & **Bewley, T** (2001) H_inf control of linear global instability in models of non-parallel wakes, *Second Symposium on Turbulence and Shear Flow Phenomena (TSFP)*, 247-252. Stockholm.

21. Hogberg, M, **Bewley, T**, Berggren, M, & Henningson, D (2001) Optimal control of transition initiated by oblique waves in channel flow *Second Symposium on Turbulence and Shear Flow Phenomena (TSFP)*, 157-161. Stockholm.

22. **Bewley, T**, & Trenchea, C. (2002) Noncooperative optimizations of controls for time-periodic Navier-Stokes systems with multiple solutions, 1st AIAA Flow Control Conference *AIAA Paper 2002-2754*. St. Louis. **Invited lecture.**

23. **Bewley, T** (2002) The emerging roles of model-based control theory in fluid mechanics. Advances in Turbulence IX (Editors: Castro, Hancock, & Thomas). *Proceedings of the Ninth European Turbulence Conference*, 553-564. Southampton. **Invited lecture.**

24. Protas, B, & **Bewley, T** (2002) Regularization opportunities in the adjoint analysis of multiscale systems. Advances in Turbulence IX. *Proceedings of the Ninth European Turbulence Conference*, 505-510. Southampton.

25. Bewley, T (2002) Skin friction and pressure: the "footprints" of turbulence *Proceedings of the 3rd Symposium on Smart Control of Turbulence*. Tokyo. **Invited lecture.**

26. Cathalifaud, P, & **Bewley, T** (2002) A Numerically Tractable Global Framework for the Feedback Control of Boundary-Layer Perturbations ASME *Fluids Engineering Division Summer Meeting, FEDSM2002-31062*. Montreal, Quebec.

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29. Luo, H., & **Bewley, T** (2003) Design, modeling, and optimization of compliant tensegrity fabrics for the reduction of turbulent skin friction, *SPIE Paper 5049-57*. San Diego.

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34. Luo, H., & **Bewley, T** (2005) Accurate simulation of near-wall turbulence over a compliant tensegrity fabric, *SPIE Smart Structures and Materials + Nondestructive Evaluation and Health Monitoring, SPIE Paper 5757-17*, 184-197. San Diego. (**citations**)

35. Schmidt-Wetekam, C., Zhang, D., Hughes, R., & **Bewley, T** (2007) Design, optimization, and control of a new class of reconfigurable hopping rovers, *CDC, 5150-5155*. New Orleans.

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PATENTS (WITH HYPERLINKS)

US Patents (granted)
US Patent number **8083013**: Multimodal agile robots
US Patent number **9020639**: Multimodal dynamic robotic systems
US Patent number **9757855**: Multimodal dynamic robotic systems
US Patent number **9902058**: Multimodal dynamic robotic systems
US Patent number **10611019**: Multimodal dynamic robotic systems
US Patent number **10189342**: Ball-balancing robot and drive assembly therefor
(Note: I am the first author on all six of the above patents, each of which is assigned to the UC Regents.)

International (PCT) patent (applied for)
UC San Diego Patent Case SD2023-185: A new class of stable, spring-loaded, planar, roll-controlled, highly maneuverable robots for interior exploration of networks of pipes and ducts [use password checkers123]**.**

OTHER CREATIVE PRODUCTS

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2. Reversible random number generation *(ACM Transactions on Mathematical Software)*

3. A new method for approximating proportional representation in multi-seat elections based on range or approval voting *(Quarterly Journal of Political Science)*

4. A new robot design for the interior exploration and inspection of pipe networks (*Science Robotics*)

5. Probabilistic search for randomly moving targets using optimized time-periodic orbits of multiple search vehicles *(Automatica)*

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