

Dr Ben Hanson CV: Research & Academic

Research Summary

Dr Hanson's research involves biomedical applications of engineering including system modelling and analysis. He is internationally recognised for this work through citations for his publications in journals in diverse disciplines such as *Sensors & Actuators* (50 citations), *Psychological Medicine* (49 citations), *J. Food Science* (49) and *Dysphagia* (116); 879 total citations with an h-index of 18 [Google scholar, March 2018]. This work has also attracted the interest of international media (The Guardian, BBC, Time magazine) and is funded by UK charities, international corporations, and NIH (USA).

Dr Hanson is particularly interested in the biomechanics of swallowing and the use of texture-modification of foods and drinks to manage swallowing disorders, "dysphagia", often associated with ageing, stroke, dementia or cancer. He provides the engineering contribution to the first global guidelines for dysphagia diets: IDDSI.org.

Teaching and Dissemination Summary

Dr Hanson won a UCL Provost's Teaching Award in 2011 and from 2013 to 2017 was the Departmental Tutor with responsibility for all undergraduate teaching in Mechanical Engineering. He is the coordinator for 3rd year Dynamics & Control and lectures on the MSc module Applications of Biomedical Engineering. He supervises ten 3rd year and MSc individual projects per year.

In the previous 3 years Dr Hanson has given 15 invited presentations to industry and clinicians, often internationally; 4 lectures to groups of 1,000 A-level students on biomedical engineering; invited presentations for the ULC IBME and Science Club, and he hosts regular meetings comprising NHS, heads of clinical professional bodies and industrial representatives on standardisation of diets for medical purposes.

Qualifications & Career

1994 to 1998	MEng in Mechatronics (Distinction)	University of Leeds.
1998 to 2002	PhD in Mechanical Engineering	University of Leeds.
2002 to 30/09/2005	Research Fellow	University of Leeds.
01/10/2005 to present	Senior Lecturer (promoted in 2013)	UCL, (HEFCE-funded, permanent)

Other Appointments and Affiliations

Fellow, Institution of Mechanical Engineers, since May 2015 (Member since July 2007).

Fellow, Higher Education Academy, since October 2009.

Member, Institute of Food Technologists, 2010-2011.

Affiliate, UCL Division of Medicine (Faculty of Biomedical Sciences), since September 2010.

Visiting Lecturer, Division of Engineering, Kings College London, 2011-2014.

Honorary Research Associate, UCLH Heart Hospital, since July 2012.

Departmental Tutor, UCL Mechanical Engineering, since September 2013.

Prizes, Awards and Other Honours

[Provost's Teaching Award](#), UCL, July 2011 (1 of 3 awards for early-career academics per year)

Invited position on Board of [International Dysphagia Diet Standardisation Initiative](#), October 2012. Awarded Outstanding Contribution in International Achievement by the American Speech-Language-Hearing Association (ASHA), June 2016.

Grants and Funding (Competitively-awarded)

As Principal Investigator:

Co-PI on NIH 2R01DC011020-04 "Physiological Flow of Liquids Used in Dysphagia Management" £1.8M (\$2.5M USD) 5 year award \$457,693 for 2017.

IOS (iPhone) app software "iThicken" licenced through UCL Business for 3 years from 2015.

4-year PhD Studentship with Fresenius-Kabi Ltd and UCL ("HEAL" MRes scheme + IBME). (fees, stipend & equipment) Start date: 01/10/2013. Duration: 4 years. "Rheology of thickened drinks".

Funded studentship: Philanthropic donation + UCL Impact scheme £73k (fees & stipend) Start date: 8/7/2013. Duration: 3 years.

“Identifying a Model of the Control Systems Governing Cardiac Stability”.

Funded studentship: Crucible centre for Lifelong Health and Wellbeing, UCL. Co-I: Dr Christina Smith. £86k (fees & stipend) Start date: 01/10/2010, Duration: 4 years.

“Prescribed diets: the effect of mechanical consistency on health, patient safety, and quality of life”.

Funded studentship: Crucible Centre for Lifelong Health and Wellbeing, UCL. Co-I: Prof David Holder. £86k (fees & stipend), Start date: 01/10/2010, Duration: 4 years.

“Design of an electrode headset”.

EPSRC First Grant EP/G001200/1.

£259k (FEC), Start date: 01/10/2008. Duration: 2 years.

“A self-sensing instrument for investigation of rheology in dysphagia”.

EPSRC CASE studentship with Instron Ltd, CASE/CNA/07/72

£83k Start date: 01/11/2007, Duration: 3.5 years

“Performance improvement for electromagnetic motors”.

UCL Educational Research & Teaching Development Grants: E-Learning Development Grant, 2007, £1k; Academic Development Grant, 2010, £3k. Research outcomes were published in IEEE Trans. Ed. Tech.

As Co-Investigator

BHF Project Grant no. PG/16/81/32441

£287K, Start date 01/02/2017, Duration: 3 years. “Enabling clinical translation of a novel activation-repolarisation time metric for improved identification of optimal catheter ablation sites”

French Embassy Collaborative Science & Technology workshop

£3.3K, Start date 24/11/2016, End date 01/09/2017

“PHOOD: bringing together pharma and food through sensory science towards health and wellness”

BHF Clinical Research Fellowship (Ref: 41376) PI: Dr Pier Lambiase, Fellow: Neil Srinivasan

£196k, Start date: 01/02/2014, Duration: 3 years.

“Mechanisms of T wave Generation and the Identification of Dynamic ECG Biomarkers...”

MRC CASE Studentship with Boston Scientific Ltd. (Ref: MR/L015161/1) PI: Dr Pier Lambiase

£99k, Start date: 01/10/2014, Duration: 4 years.

“Investigation of dynamic absolute refractory period pacing in the prevention of lethal arrhythmias...”

MRC Project Grant (Ref G0901819) PI: Dr Pier Lambiase, UCL Heart Hospital.

£950k, Start date: 15/11/2010, Duration: 3 years

“An interactive in vivo and molecular investigation ...mechanisms of sudden cardiac death”

Royal Society / Wolfson Biomedical Laboratory Refurbishment Grant, PI: Prof M Edirisinghe

£238k, Funding Dates 01-Apr-07 to 31-Mar-08.

Industrially-funded Consultancy and Research:

10 contracts in previous 3 years

Academic Supervision

PhD Primary Supervisor:

3 x PhDs awarded, 1 x MPhil awarded, 2 currently registered.

PhD Secondary Supervisor:

2 x PhD awarded, 2 currently registered.

Postdoctoral Research Assistant Supervision:

5x postdocs for total of 5 years.

Selected Recent Publications

1. Redfearn, A. G., Hanson, B. (2018). A Mechanical Simulator of Tongue-Palate Compression to Investigate the Oral Flow of Non-Newtonian Fluids. *IEEE/ASME Transactions on Mechatronics*. Published online ahead of print (DOI: 10.1109/TMECH.2018.2808704).
2. Steele, C. M., Namasivayam-MacDonald, A. M., Hanson, B., . . . Riquelme, L. F. (2018). Creation and Initial Validation of the International Dysphagia Diet Standardisation Initiative Functional Diet Scale. *Archives of physical medicine and rehabilitation*. (DOI:10.1016/j.apmr.2018.01.012).
3. Cichero, J. A., Lam, P., Steele, C. M., Hanson, B., Chen, J., Dantas, R. O., . . . Stanschus, S. (2016). Development of International Terminology and Definitions for Texture-Modified Foods and Thickened

Fluids Used in Dysphagia Management: The IDDSI Framework.. Dysphagia. doi:10.1007/s00455-016-9758-y

4. Chen, Z., Hanson, B., Sohal, M., Sammut, E., Jackson, T., Child, N.,... Taggart, P. (2016). Coupling of ventricular action potential duration and local strain patterns... *Heart Rhythm*, 13(9), 1898-1904.
5. Hanson, B. (2016). A review of diet standardization and bolus rheology in the management of dysphagia. *Current opinion in otolaryngology & head and neck surgery*, 24(3), 183-190.
6. Hill, Y. R., Child, N., Hanson, B., Wallman, M., Coronel, R., Plank, G., . . . Bishop, M. J. (2016). Investigating a Novel Activation-Repolarisation Time Metric to Predict ... Re-entry Using Computational Modelling. *PLoS One*, 11(3), e0149342. doi:10.1371/journal.pone.0149342
7. Zhou, X., Bueno-Orovio, A., Orini, M., Hanson, B., Hayward, M., Taggart, P., . . . Rodriguez, B. (2016). In Vivo and In Silico Investigation Into ... Repolarization Alternans in Human Ventricular Cardiomyocytes. *Circulation Research*, 118(2), 266-278. doi:10.1161/CIRCRESAHA.115.307836
8. Steele, C. M., Chen, J., Cichero, J. A. Y., Dantas, R. O., Duivesteyn, J., Hanson, B., . . . Smith, C. H. (2015). The Influence of Food Texture and Liquid Consistency ... A Systematic Review. *Dysphagia*, 30(1), 2-26. doi:10.1007/s00455-014-9578-x
9. van Duijvenboden, S., Hanson, B., Child, N., Orini, M., Rinaldi, C. A., Gill, J. S., & Taggart, P. (2015). Effect of autonomic blocking ... action potential duration in humans. *American Journal of Physiology-Heart and Circulatory Physiology*, 309(12), H2108-H2117. doi:10.1152/ajpheart.00560.2015
10. Child, N., Bishop, M. J., Hanson, B., . . . Taggart, P. (2015). An activation-repolarization time metric to predict ... susceptibility to re-entry. *Heart Rhythm*. doi:10.1016/j.hrthm.2015.04.013
11. Western, D. G., Hanson, B., & Taggart, P. (2015). Measurement Bias in ... Electrograms. *American Journal of Physiology: Heart and Circulatory Physiology*. doi:10.1152/ajpheart.00478.2014
12. Reinecke, A., Filippini, N., Berna, C., Western, D. G., Hanson, B., Cooper, M. J., . . . Harmer, C. J. (2015). Effective emotion regulation strategies improve fMRI and ECG markers of psychopathology ... *Translational Psychiatry*, 5, 10 pages. doi:10.1038/tp.2015.160
13. Child, N., Hanson, B., . . . Taggart, P. (2014). Effect of Mental Challenge Induced by Movie Clips... *Circulation Arrhythmia & Electrophysiology*. doi:10.1161/CIRCEP.113.000909
14. Taggart, P., Orini, M., Hanson, B., Hayward, M., Clayton, R., Dobrynski, H., . . . Lambiase, P. D. (2014). Developing a novel comprehensive framework for... electrophysiology... *Progress in Biophysics & Molecular Biology*. doi:10.1016/j.pbiomolbio.2014.06.004
15. Hanson, B., Van Duijvenboden, S., . . . Coronel, R. (2014). Oscillatory behaviour of ventricular action potential duration... *Frontiers in Physiology*, 5(OCT). doi:10.3389/fphys.2014.00414
16. Orini, M., Hanson, B., Monasterio, V., Martinez Cortez, J., Hayward, M., . . . Lambiase, P. (2014). Comparative Evaluation of Methodologies for T-wave Alternans Mapping in Electrograms. *IEEE Transactions on Biomedical Engineering*, 2014 Feb;61(2):308-16.
17. Bueno-Orovio, A., Hanson, B. M., Gill, J. S., Taggart, P., & Rodriguez, B. (2014). Slow Adaptation of Ventricular Repolarization as a Cause of Arrhythmia?. *Methods of Information In Medicine*, 53(4), 320-323. doi:10.3414/ME13-02-0039
18. Cowpe (Jebson), E., Hanson, B., & Smith, C. H. (2014). What do parents of children with dysphagia think about their MDT?... *BMJ Open*, 4(10), e005934. doi:10.1136/bmjopen-2014-005934
19. Chen, Z., Hanson, B., Sohal, M., Sammut, E., Child, N., Shetty, A., . . . Taggart, P. (2013). Left Ventricular Epicardial Electrograms Show Divergent Changes... *Circulation: Arrhythmia and Electrophysiology*, 6 (2), 265-271. doi:10.1161/CIRCEP.112.000148
20. Jebson, E., Hanson, B. M., & Smith, C. (2013). Thickened fluids: Investigation of users' experiences and perceptions. *Clinical Nutrition*. 33(1), 171-174. doi:10.1016/j.clnu.2013.10.012
21. Hanson, B., Gill, J., Western, D., Gilbey, M. P., Bostock, J., Boyett, M. R., . . . Taggart, P. (2012). Cyclical modulation of human ventricular repolarization by respiration. *Frontiers in Physiology*, 3. doi:10.3389/fphys.2012.00379
22. Di Simplicio, M., Harmer, C. J., Costoloni, G., Western, D., Hanson, B., & Taggart, P. (2012). Decreased heart rate variability during emotion regulation in subjects at risk for psychopathology. *Psychological Medicine*, 42 (8), 1775-1783. doi:10.1017/S0033291711002479
23. Hanson, B., Cox, B., Kaliviotis, E., & Smith, C. H. (2012). Effects of saliva on starch-thickened drinks with acidic and neutral pH. *Dysphagia*, 27 (3), 427-435. doi:10.1007/s00455-011-9386-5
24. Hanson, B., O'Leary, M. T., & Smith, C. H. (2012). The Effect of Saliva on the Viscosity of Thickened Drinks. *Dysphagia*, 27 (1), 10-19. doi:10.1007/s00455-011-9330-8