

Kimberly Binsted

GOV. MSG. NO. 661

## Kim Binsted

### Education

Geology and Geophysics Department, University of Hawaii Honolulu  
*MS in Planetary Geology (part time)*  
Topic: "Characterizing the deuterium-hydrogen ratio in the primitive mantle"

AI Department, University of Edinburgh Edinburgh  
*PhD in Artificial Intelligence*  
Dissertation title: "Machine humour: An implemented model of puns"

AI Department, University of Edinburgh Edinburgh  
*MSc in Artificial Intelligence (with distinction), turned into 1<sup>st</sup> year of PhD*

Physics Department, McGill University Montreal  
*BSc in Physics*

### Positions

2002 (January) – present Inf. and Computer Sci. Dept., University of Hawaii Honolulu  
*Professor (tenured in August 2007, promoted to full professor in 2015)*

- Teaching graduate and undergraduate courses in artificial intelligence, astrobiology, space exploration, cognitive science, and design for mobile devices.
- Conducting research on human factors and behavioral health and performance in long-term space exploration, computational astrobiology, the evolution of intelligence, and human-computer interfaces.

2009 (June) – 2010 (August) Canadian Space Agency Montreal  
*Program Scientist (on sabbatical from UH)*

- Conducting research on augmented shared reality systems for communication between an astronaut and a ground-based science team
- Reviewing funding proposals
- Preparing for 2010 ISRU/rover field tests
- Mission scientist for CSA on MoonRise, a proposed sample return mission to the Moon's South Pole Aitken Basin.

2003 & 2004 NASA Ames Research Center Mountain View, CA  
*Summer Faculty Fellow*

- Conducted research on sub-vocal speech recognition, with Chuck Jorgensen of the Neuroengineering Lab.

2000 – 2008 Binsted-McKay LLC, YG Tokyo/Honolulu  
*Founder, Managing Partner*

- Binsted-McKay LLC is a consultancy (currently dormant) specializing in artificial intelligence, human-computer interaction and mobile computing.

1998 (January) – 2000 (May) Sony Computer Science Lab Tokyo  
*Associate Researcher*

- Conducted research on entertaining, expressive and responsive human-computer interfaces.

1997 (spring) Kansai Advanced Research Center Kobe  
*Researcher, Science and Technology Agency Post-Doctoral Fellow*

- Implemented and evaluated a pun generation system in Japanese.

*Earlier employment information available on request.*

## Research Activities (since 2007)

- As Principal Investigator on HI-SEAS (Hawaii Space Exploration Analog and Simulation, hi-seas.org), conducting research on crew selection, composition, cohesion and performance. HI-SEAS has been funded by the NASA Human Research Program since 2012 (3 grant cycles).
- Conducted research on space analog environments as Co-Investigator with the UH NASA Astrobiology Institute (2003-present).
- Served as Program Scientist at the Canadian Space Agency (on sabbatical from UH) in 2009/2010. Conducted research on augmented shared reality systems for communication between an astronaut and a ground-based science team. Served as Mission Scientist on MoonRise, a proposed sample return mission to the Moon's South Pole Aitken Basin.
- Worked on MS in Planetary Geology with Gary Huss of HIGP. Thesis topic: "Characterizing the deuterium-hydrogen ratio in the primitive mantle". Completed in 2015.
- Participated in the 2010 and 2012 NASA field deployments on the Island of Hawaii.
- Served as Chief Scientist on the FMARS XI Long Duration Mission (2007) in the Canadian High Arctic.

## Selected Peer-Reviewed Papers and Presentations (since 2009)

[See <http://www2.hawaii.edu/~binsted/papers/Publications.html> for an up-to-date list.]

Engler, S. T., Binsted, K., & Leung, H. (2019). "HI-SEAS habitat energy requirements and forecasting." *Acta Astronautica*.

Goemaere, S., Brenning, K., Beyers, W., Vermeulen, A. C., Binsted, K., and Vansteenkiste, M. (2019). "Do astronauts benefit from autonomy? Investigating perceived autonomy-supportive communication by Mission Support, crew motivation and collaboration during HI-SEAS 1." *Acta Astronautica*, 157, 9-16.

Goemaere, S., Van Caelenberg, T., Beyers, W., Binsted, K., and Vansteenkiste, M. (2019). "Life on mars from a Self-Determination Theory perspective: How astronauts' needs

- for autonomy, competence and relatedness go hand in hand with crew health and mission success-Results from HI-SEAS IV." *Acta Astronautica*.
- Bleacher, J.E., Shiro, B., McAdam, A., Young, K., Garry, W.B., Whelley, P., Richardson, J.A., Rowland, S.K., Binsted, K., Caldwell, B. and Glotch, T.D. (2018). "Studies of Young Hawaiian Lava Tubes to Develop Techniques for Interpreting Lava Emplacement and Inferring Past Environment on the Moon and Mars." In AGU Fall Meeting Abstracts.
- Engler, S., Hunter, J., Binsted, K., and Leung, H. (2018). "Robotic Companions for Long Term Isolation Space Missions." In 2018 15th International Conference on Ubiquitous Robots (UR) (pp. 424-430). IEEE.
- Idota, T., Biagioni, E., and Binsted, K. (2018). Swarm Exploration of Extraterrestrial Lava Tubes with Ad-Hoc Communications. In 2018 6th IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE) (pp. 163-168). IEEE.
- Binsted K., Basner M., Bedwell W., Caldwell B., Hunter J., Kozlowski S., Roma P., and Schmer-Galunder S. (2018). "HI-SEAS: Overview of Results from the Four, Eight and Twelve Month Missions." NASA Human Research Program Investigators' Meeting, Galveston, TX.
- Olenick J., Webb J., Dishop C., Binsted K., Chang C., and Kozlowski S. (2018). "Team Dynamics and Granger Causality in a Long Duration Flight Analog." NASA Human Research Program Investigators' Meeting, Galveston, TX.
- Dunn J., Orr M., and Binsted K. (2018). "Comparison and Fusion of Multiple Data Sources from Long-Duration Spaceflight Analog Missions for Integrated Health and Stress Monitoring." NASA Human Research Program Investigators' Meeting, Galveston, TX.
- Ehrlich, J.W., Massa, G., Wheeler, R., Gill, T.R., Quincy, C., Roberson, L., Binsted, K. and Morrow, R. (2017). Plant Growth Optimization by Vegetable Production System in HI-SEAS Analog Habitat. In AIAA SPACE and Astronautics Forum and Exposition (p. 5143).
- Hauptlik-Meusburger, S., Binsted, K., and Bassingthwaighe, T. (2017). Habitability Studies and Full Scale Simulation Research: Preliminary themes following HISEAS mission IV. 47th International Conference on Environmental Systems. Dunn, J., Huebner, E., Liu, S., Landry, S., & Binsted, K. (2017). Using consumer-grade wearables and novel measures of sleep and activity to analyze changes in behavioral health during an 8-month simulated Mars mission. *Computers in Industry*, 92, 32-42.
- Ehrlich, J. W., Massa, G. D., Wheeler, R. M., Gill, T. R., Quincy, C. D., Roberson, L. B., Binsted, K., & Morrow, R. C. (2017, September). Plant Growth Optimization by Vegetable Production System in HI-SEAS Analog Habitat. In AIAA SPACE and Astronautics Forum and Exposition (p. 5143).
- Caldwell, B. and Binsted K. (2017). "Frequency Of HI-SEAS Crew Communications To Mission Support During 4-, 8-, And 12-Month Simulated Planetary Exploration Missions." NASA Human Research Program Investigators' Meeting, Galveston, TX.
- Nasrini, J., Dinges, D.F., McGuire, S., Hermosillo, E., Ecker, A.J., Mollicone, D.J., Mott, C.G., Binsted, K., Caldwell, B., Moore, T.M., Gur, R.C., Basner, M. (2017). "Cognitive Performance In Long-Duration Mars Simulations At The Hawaii Space Exploration Analog And Simulation (HI-SEAS)." NASA Human Research Program Investigators' Meeting, Galveston, TX.

- Binsted K., Basner M., Bedwell W., Bishop, S., Caldwell B., Chang D., Hunter J., Kozłowski S., Roma P., Shiro B., and Wu P. (2017). "Investigations At Hi-Seas Into Team Function And Performance On, And Crew Composition For, Long Duration Exploration Missions." NASA Human Research Program Investigators' Meeting, Galveston, TX.
- Dunn, J., Landry S., and Binsted, K. (2017). "Trajectories of Health and Stress in Long-Duration Mars Analog Crews." NASA Human Research Program Investigators' Meeting, Galveston, TX.
- Gushin, V.I., Binsted, K., Demin, E.P. Kommissarova, D.V., Belakovskiy, M.S. "Experiences and perspectives of model isolation studies in Russia and the USA." *Aviacosmicheskaya i ekologicheskaya meditsina*, 2016, Vol.50, #5, p. 61-62.
- Ott, T., Wu, P., Morie, J., Wall, P., Ladwig, J., Chance E., Haynes, K., Bell, B., Miller, C., and Binsted, K. (2016). "ANSIBLE: A Virtual World Ecosystem for Improving Psycho-Social Well-being." In *International Conference on Virtual, Augmented and Mixed Reality*, pp. 532-543. Springer International Publishing.
- Wu, P., Morie, J., Wall, P., Ott, T., & Binsted, K. (2016). "ANSIBLE: Virtual Reality for Behavioral Health." *Procedia Engineering*, 159, 108-111. Roma, P., Binsted, K., Caldwell, B., and Shiro, B. (2016). "Team Cohesion, Performance, and Biopsychosocial Adaptation Research at the Hawai'i Space Exploration Analog and Simulation (HI-SEAS)." *Society for Industrial and Organizational Psychology Annual Conference*, Anaheim, California.
- Anderson, A. P., Fellows, A. M., Binsted, K. A., Hegel, M. T., & Buckey, J. C. (2016). "Autonomous, Computer-Based Behavioral Health Countermeasure Evaluation at HI-SEAS Mars Analog." *Aerospace medicine and human performance*, 87(11), 912-920.
- Anderson, A., Fellows, A., Hegel, M., Binsted, K., and Buckey, J. (2016). "Evaluation Of An Autonomous, Computer-Based Behavioral Health Countermeasure In An Isolated, Confined Environment." *Aerospace Medical Association Annual Scientific Meeting*, Atlantic City, NJ.
- Anderson, A., Fellows, A., Hegel, M., Binsted, K., and Buckey, J. (2016). "Autonomous Behavioral Health Countermeasures for Spaceflight - Virtual Space Station." *NASA Human Research Program Investigators' Meeting*, Galveston, TX.
- Bedwell W., Roma P., and Binsted K. (2016). "Crew Cohesion on LDEM: A Longitudinal Look at Conflict." *NASA Human Research Program Investigators' Meeting*, Galveston, TX.
- Binsted K., Basner M., Bedwell W., Caldwell B., Chang D., Hunter J., Kozłowski S., Nasrini J., Roma P., Santoro J., Seibert M., Shiro B., and Wu P. (2016). "Investigations at HI-SEAS into Team Function and Performance on Long Duration Exploration Missions." *NASA Human Research Program Investigators' Meeting*, Galveston, TX.
- Santoro J., Dixon A., Binsted K., Chang C., and Kozłowski S. (2016). "Tracking Long-Term Dynamics: The Hawai'i Space Exploration Analog and Simulation." *NASA Human Research Program Investigators' Meeting*, Galveston, TX.
- Hunter, J., Binsted, K., and Drago, R.E. (2015). "Nutritional intake of analog subjects consuming prepackaged or crew-prepared foods." *Human Research Program Investigators Workshop*, Houston, Texas.
- Binsted K., Bedwell W., Caldwell B., Hunter J., Kozłowski S., Miller C., Roma P. (2015). "Preliminary results on team function and performance from Hawaii Space

- Exploration Analog and Simulation (HI-SEAS)." Human Research Program Investigators Workshop, Houston, Texas.
- Shiro, B., Binsted, K., and Rowland, K. (2014). "Geological field activities at the HI-SEAS planetary surface analog mission simulation in Hawai'i". NASA Exploration Science Forum, Moffett Field, California.
- Poulet, L., Massa, G., Wheeler, R., Gill T., Steele, C., Morrow, R.C., Swarmer, T., Hunter, J., Binsted K. (2014). "Demonstration Test of Electrical Lighting Systems for Plant Growth in HI-SEAS Analog Mars Habitat". 65<sup>th</sup> International Astronautical Congress in Toronto, Canada. IAC-14,A5,2.9x25271.
- Binsted, K., Bedwell, W., Caldwell, B., Hunter, J., Kozlowski, S., Miller, C., Roma, P. (2014). "Determining key contributors to the maintenance and regulation of team function and performance on long duration exploration missions at the HI-SEAS analog habitat". 65th International Astronautical Congress in Toronto, Canada. IAC-14,A1,P,27,x27063.
- Engler, S., Caraccio, A., Binsted, K., Wiecking, B., Leung, H. (2014). "Towards Forecasting Resource Consumption in Mars Analog Simulations." The 8th Annual International Mars Conference, July 14th-18th, CalTech, Pasadena, California.
- Binsted, K., Bedwell, W., Caldwell, B., Dumas, A., Hunter, J., Kozlowski, S., Roma, P., Shiro, B. (2014). "Determining Key Contributors to the Maintenance and Regulation of Team Function and Performance on Long Duration Exploration Missions at the HI-SEAS Habitat". Human Research Program Investigators Workshop, Houston, Texas.
- Engler, S., Hunter, J., Schick, A., Binsted, K., and Leung, H. (TBD) "Robotic Companions for Long Term Isolation Space Missions". IEEE Robotics and Automation.
- Engler, S., Abramov, O., Binsted, K., Hunter, J., Leung, H., and Wiecking, W. (2013). "Planetary Habitat Systems Monitoring On a Mars Analog Mission". 100YSS Symposium, Houston, Texas.
- Binsted, K., Hunter, J., Halpern, B., and Caldwell, B. (2013). "HI-SEAS: A long-duration human spaceflight analog in Hawaii". 64<sup>th</sup> International Astronautical Congress. Space Life Sciences Symposium, Session: Behaviour, Performance and Psychosocial Issues in Space. Beijing, China.
- Caldwell, B., Halpern, B., Binsted, K., and Hunter, J. (2013). "Monitoring cephalad fluid shift induced nasal tissue swelling in 70-day 6° head-down tilt". Humans in Space Symposium, Cologne, Germany.
- Shiro, B., Binsted, K., and Hunter, J. (2013). "HI-SEAS: A Planetary Surface Analog Mission Simulation in Hawaii". International Conference on Environmental Systems, Vail, Colorado.
- Binsted, K., Hunter, J., and Caldwell B. (2012). "Reducing the risks of long-term human space exploration by simulating missions in an analog environment on Mauna Loa". Human Research Program Investigators Workshop, Houston, Texas.
- Battler, M.M., Bishop, S.L., Kobrick, R.L., Binsted, K. and Harris, J. (2011): "The "Us versus Them" Phenomenon: Lessons from a Long Duration Human Mars Mission Simulation". 62nd International Astronautical Congress. Space Life Sciences Symposium, Session: Behaviour, Performance and Psychosocial Issues in Space. IAC-11-A1.1.6.x11551. Cape Town, South Africa.

- Binsted, K., Kobrick, R., OGriofa, M., Bishop, S., Lapierre, J. (2010). Human factors research as part of a Mars exploration analogue mission on Devon Island. *Planetary and Space Science*. 58: 994-1006.
- Hunter, J. and Binsted, K. (2010). Food preparation strategies and food satisfaction under Mars mission analogue conditions. Proceedings of the International Astronautical Conference, Prague, Czech Republic.
- Binsted, K. (2010). Augmented shared reality tools for collaborative science on a planetary exploration analogue mission. Proceedings of the Astrobiology Science Conference, League City, TX, USA.
- Bergen, B., & Binsted, K. (2010). Embodied Grammar and Humor. *Cognitive Linguistics and Humor*.
- Bamsey, M., Berinstain, A., Auclair, S., Battler, M., Binsted, K., Bywaters, K., Harris, J., Kobrick, R., McKay, C. (2009). Four month Moon and Mars crew water utilization study conducted at the Flashline Mars Arctic Research Station, Devon Island, Nunavut. *Advances in Space Research*.
- Bishop, S., Kobrick, R., Battler, M. and Binsted, K. (2009). FMARS 2007: Stress And Coping In An Arctic Mars Simulation. *Acta Astronautica*. 66: 1353-1367.
- Binsted, K. (2009). Human factors research in analogue environments: Lessons learned and recommendations. Proceedings of the 2009 Workshop on Human Behaviour & Performance in Analogue Environments & Simulations, Noordwijk, The Netherlands.
- Binsted, K. (2009). An overview of the human factors research conducted on a four-month Mars simulation in the Canadian High Arctic, with recommendations for future analogue research. Proceedings of Humans in Space 2009, Moscow, Russia.
- Tomaszewski, Z., & Binsted, K. (2009). Demeter: An Implementation of the MarlinSPIKE Interactive Drama System. In *AAAI Spring Symposium: Intelligent Narrative Technologies II* (p. 133).

### Patents

- Binsted, K., Nielsen, F., and Pinhanez, C. (2003). "Method and apparatus for image projection, and apparatus controlling image projection." US Patent 6,554,431.
- Shimomura, H., Fujita, M., Yamada, K., Di Profio, U., McKay, J., Binsted, K. (2003). "Sentence creation apparatus and creation method." US Patent 7,487,081.

### Current Grants

- "Key contributors to the maintenance and regulation of team function and performance on long duration exploration missions." Amount: ~\$1.2M over three years (2013-2017). Role: Principal Investigator. Funding agency: NASA.
- "Using Analog Missions to Develop Effective Team Composition Strategies for Long Duration Space Exploration." Amount: ~\$1M over three years (2015-2018). Role: Principal Investigator. Funding agency: NASA.
- Fulbright Award to conduct research on long-duration space exploration at the Institute for Biomedical Problems in Russia. Role: Fulbright Scholar.

## Service and Outreach

- State Department sponsored US Speaker Program participant. Spent a week in Kuwait in 2017, where I spoke at the International Conference for Women Leaders in Science, Technology and Engineering and various schools and universities.
- Pacific International Center for Space Exploration Systems (PISCES) Board Member, Hawaii State Senate appointment.
- METI Advisory Council Member.
- Full Member of the International Academy of Astronautics.
- Reviewer for: Planetary and Space Science, Cognitive Science, IEEE Transactions on Biomedical Engineering, Humor, Interacting with Computers, IEEE Transactions on Knowledge and Data Engineering, Affective Computing and Intelligent Interaction, Computer Human Interaction, IEEE Intelligent Systems, Intelligent Technologies for Interactive Entertainment (INTETAIN).
- American Association for the Advancement of Science member.
- Served on the Chancellor Search Committee (2011-2012).
- Organized the Computational Astrobiology Summer School/Symposium (2006, 2010, 2011).
- Speaker in the UH Faculty Ambassadors Program.
- Frequent speaker at education and public outreach events (typically ~12 per year)
- ICS Graduate Chair (2007-2009)
- Two terms as Manoa Faculty Senate member, on Committee for Student Affairs.
- University Representative on multiple (~15 at last count) PhD committees at the Institute for Astronomy.
- According to UH Public Relations, the HI-SEAS program has had a "Total Calculated Publicity Value" of at least 6 million USD.

## Certifications and qualifications

- Scuba: PADI Master Diver, Rescue Diver. Specialties: underwater videographer, underwater naturalist, night diver, dry-suit diver, enriched air diver.
- Flying: Private pilot license (2002), instrument flight rating (2008), over 250 hours logged.
- First Responder: Emergency First Aid Certificate, Wilderness First Aid Certificate, Emergency Medical Technician
- Japanese (Proficiency Test Level 3), Russian (elementary), French (advanced)

**References provided on request.**