

**CHAITANYA KRISHNA PRASAD VALLABH, Ph.D.**[vallabh.8@osu.edu](mailto:vallabh.8@osu.edu)

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**RESEARCH INTERESTS**

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Acoustics, wave propagation, ultrasonics, microparticle adhesion and manipulation, mechanical vibrations, additive manufacturing, microelectromechanical systems, cell mechanics and interfacial mechanics

**EDUCATION**

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Doctor of Philosophy, Mechanical Engineering.

**Clarkson University**, Potsdam, NY

Thesis: Spatial Surface Energy Mapping for Single Microparticles

Adviser: Professor Cetin Cetinkaya

December 2017

Master of Science, Mechanical Engineering.

**Clarkson University**, Potsdam, NY

Thesis: Predicting Electrical Charge on Single Patch-charged Microparticles

Adviser: Professor Cetin Cetinkaya

June 2014

Bachelor of Technology, Aeronautical Engineering.

**Vignan's Institute of Technology and Aeronautical Engineering**, India

May 2012

**PROFESSIONAL APPOINTMENTS**

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**Postdoctoral Researcher**

Dept. of Mechanical and Aerospace Engineering, The Ohio State University

January 2018 -

Present

**Graduate Teaching Assistant**

Dept. of Mechanical and Aeronautical Engineering, Clarkson University

August 2012 –

December 2017

**Research Intern**

Advanced System Laboratories (ASL), Defence Research and Development Organisation (DRDO), Hyderabad, India

May 2011 – May

2012

**RESEARCH PUBLICATIONS**

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[https://scholar.google.com/citations?user=p3eZ\\_9kAAAAJ&hl=en](https://scholar.google.com/citations?user=p3eZ_9kAAAAJ&hl=en)

Peer-Reviewed Journal Publications:

1. **Vallabh, Chaitanya Krishna Prasad**, and Cetin Cetinkaya. "Adhesion distribution on the surface of a single microparticle." *Applied Physics Letters* 109.12 (2016): 121602.
2. **Vallabh, Chaitanya Krishna Prasad**, James D. Stephens, Grazyna Kmiecik-Lawrynowicz, Santokh Badesha, and Cetin Cetinkaya. "Effect of surface temperature on adhesion of nanoparticle-coated microparticles." *Powder Technology* 298 (2016): 57-64.
3. **Vallabh, Chaitanya Krishna Prasad**, James D. Stephens, and Cetin Cetinkaya. "Effect of surface temperature on microparticle-surface adhesion." *Applied Physics Letters* 107.4 (2015): 041607.
4. **Vallabh, Chaitanya Krishna Prasad**, James D. Stephens, Grazyna Kmiecik-Lawrynowicz, Santokh Badesha, Maura Sweeney, and Cetin Cetinkaya. "Predicting electrostatic charge on single microparticles." *Powder Technology* 286 (2015): 684-696.
5. **Vallabh, Chaitanya Krishna Prasad**, Armin Saedi Vahdat, and Cetin Cetinkaya. "Charge contribution to patch-charged microparticle adhesion." *Applied Physics Letters* 105.21 (2014): 211905.
6. Xu, Xiaochi, **Chaitanya Krishna Prasad Vallabh**, Ajay Krishnan, Scott Volk, and Cetin Cetinkaya. "In-Process Thread Orientation Monitoring in Additive Manufacturing" *3D Printing and Additive Manufacturing* (2018) *In Press*
7. Xu, Xiaochi, **Chaitanya Krishna Prasad Vallabh**, Stephen W. Hoag, Vivek S. Dave, and Cetin Cetinkaya. "Early detection of capping risk in pharmaceutical compacts." *International journal of pharmaceutics* 553, no. 1-2 (2018): 338-348.

8. Xu, Xiaochi, Connor Mack, Zachary J. Cleland, **Chaitanya Krishna Prasad Vallabh**, Vivek S. Dave, and Cetin Cetinkaya. "Correlation of solid dosage porosity and tensile strength with acoustically extracted mechanical properties." *International journal of pharmaceutics* 542, no. 1-2 (2018): 153-163.
9. Xu, Xiaochi, **Chaitanya Krishna Prasad Vallabh**, Zachary James Cleland, and Cetin Cetinkaya. "Phononic Crystal Artifacts for Real-Time In Situ Quality Monitoring in Additive Manufacturing." *Journal of Manufacturing Science and Engineering* 139, no. 9 (2017): 091001.
10. Farzi, Bahman, **Chaitanya Krishna Prasad Vallabh**, James D. Stephens, and Cetin Cetinkaya. "Pre-rolling leaning of microparticles." *Powder Technology* 311 (2017): 88-100.
11. Farzi, Bahman, **Chaitanya Krishna Prasad Vallabh**, James D. Stephens, and Cetin Cetinkaya. "Critical rolling angle of microparticles." *Applied Physics Letters* 108 (2016): 111602.
12. Vahdat, Armin Saeedi, **Chaitanya Krishna Prasad Vallabh**, Bruno C. Hancock, and Cetin Cetinkaya. "Ultrasonic approach for viscoelastic and microstructure characterization of granular pharmaceutical tablets." *International journal of pharmaceutics* 454, no. 1 (2013): 333-343.

#### Conference Publication:

Armin Saeedi Vahdat, **Chaitanya Krishna Prasad Vallabh**, Bruno C. Hancock, and Cetin Cetinkaya, "Viscoelastic and Microstructure Characterization of Granular Pharmaceutical Compactions", 4th Canadian Conference on Nonlinear Solid Mechanics (CanCNSM 2013).

#### Poster Presentations:

1. Center for Advanced Materials Processing (CAMP) conferences May 2013 and 2014, Saratoga Springs, NY
2. CAMP conference May 2016, Canandaigua, NY. **Secured 2<sup>nd</sup> position** under "Best overall poster award" category for the poster titled "Real-time In-Situ Quality Monitoring of 3D Printed Objects at Fiber/Bond-scale"
3. CAMP conference May 2017, Canandaigua, NY.
4. Center for Metamaterials Fall IAB Meeting, Oct. 2016, Corning, NY.

## **RESEARCH EXPERIENCE**

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### **Hoelzle Research Lab at The Ohio State University**

*Mechanically activated phenotyping and sorting (MAPS): January 2018 – Present*

- MAPS is MEMS device developed for ensemble phenotyping and sorting biological cells with applications in cancer.
- My main focus in this project is developing an experimental setup and procedure for characterizing ensemble phenotypes (mechanical properties and fluorescence-expressed biomarkers) of model cell particles and cancer cells

### **Photo-Acoustics Research (PAR) Lab, Clarkson University**

*Adhesion Energy Mapping of a Single Microparticle: May 2016 – December 2017*

- Designed and developed a non-contact experimental technique employing Surface Acoustic Wave (SAW) excitation to map the adhesion energy distribution on the surface of a single microparticle.
- By employing this technique, the surface morphology of single microparticles can be characterized based on the adhesion energy at different locations.
- Further, the current experimental setup is being developed to evaluate surface adhesion maps on different types of microparticles (polymers, toner, metal particles, particles used in additive manufacturing etc.).

### **Collaboration with Intel Corporation:**

*Evaluating the surface energy of electronic packaging chips: March 2016 – December 2017*

- Evaluated the surface energy of electronic packaging chips (provided by Intel Corp.) by employing the developed non-contact – SAW ultrasonic experimental methods. The obtained experimental results were in agreement with the surface energy measurements acquired by Intel Corp. using other contact techniques.
- This method can be utilized to determine the surface energy on the surface of an electronic packaging chip in locations where contact techniques fail.
- This work can also be applied to characterize the surface energy of thin films, surface coatings etc.

### **Collaboration with Xerox Corporation:**

*Dynamics of Patch-Charged Micro Particles on Oscillating Substrates in Electric Fields (NSF Award Number: 1066877): January 2013 – December 2014*

- Designed and developed a novel non-contact ultrasonic experimental method for predicting the effect of surface charge on microparticle adhesion.
- The equivalent electrostatic bulk charge on a *single* microparticle was determined using a non-contact ultrasonic experimental method for the first time. Also, the patch-charged behavior of toner particles (provided by Xerox. Corp) was experimentally observed.
- Collaborated with Xerox. Corp and co-authored a journal paper with Xerox. Corp scientists.

*Effect of Surface Temperature on Microparticle Adhesion*: January 2015 – February 2016

- Designed and developed a non-contact ultrasonic experimental technique to determine the effect of surface temperature on microparticle adhesion.
- Experimental results concluding the decrease in the surface energy of substrate (Silicon) due to increase in surface temperature were reported for the first time.

*Adhesion distribution of pigmented Toner Particles*: August 2016 – December 2017

- Estimated the adhesion distribution of various toner particles with different surface coverage ratios and different pigment blends using the developed non-contact experimental technique.
- Applications of this work lie in determining the mean surface energy/adhesion energy of a single toner particle in a non-contact manner for a varied range of material compositions.

#### **Additional Research Projects at Photo-Acoustics Research (PAR) Lab, Clarkson University:**

*Ultrasonic Approach for Viscoelastic and Microstructure Characterization of Granular Pharmaceutical Tablets*: August – December 2012

- Hands-on experience on grain size characterization of pharmaceutical tablets.
- Characterized the grain size distribution of pharmaceutical tablets; co-authored a journal paper for this work.

*Developing an Automatic Tablet Tester Machine Integrated with LabVIEW* – September 2014 – December 2017

- Developed motion control system (both hardware and software) for a tablet testing machine, which included programming (in collaboration with another Ph.D. student) stepper motors using LabVIEW.
- Mentored a number of undergraduate students in designing, 3D printing and building the necessary hardware for the machine development.

*Quality Monitoring of 3D Printed Objects at Fiber/Bond-scale* – January 2016 – December 2017

- Mentored and assisted a fellow Ph.D. student in developing the experimental methods to monitor the quality of 3D printed artifacts. Also, co-authored two journal articles corresponding to this work.

#### **INVITED TALKS:**

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1. *Spatial Surface Energy Distribution on Single Microparticles*, Department of Mechanical and Aerospace Engineering, The Ohio State University, October 26, 2017
2. *Microparticle Adhesion Characterization Using Non-contact Methods*, Boehringer Ingelheim Pharmaceuticals, Inc., June 28, 2017

#### **PROPOSAL WRITING EXPERIENCE:**

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- Assisted my Ph.D. advisor in writing two NSF proposals, submitted to the NSF CMMI division
- Assisted my Post-doc advisor in writing and submitting an NIH proposal

#### **ACADEMIC SERVICE**

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##### **Reviewer:**

- Scientific Reports (2018 - present)
- AIP Advances (2018 - present)
- International Journal of Pharmaceutics (2017 - present)
- Proceedings of the National Academy of Sciences, India Section B: Biological Sciences (2017 – present)

#### **PROFESSIONAL SOCIETIES**

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American Society of Mechanical Engineers, 2018 – present

Adhesion Society, 2018 – Present

## **TEACHING EXPERIENCE**

### **Teaching Assistant, Clarkson University (August 2012 – December 2017)**

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*Duties as a TA included grading of homework assignments and exams, holding office hours, recitations, setting homework problems etc.*

Fall 2012 – ES 222 – Strength of Materials – Class Strength – 100

Spring 2013 – ME 411 – Introduction to Heat Transfer – Class Strength – 120

Fall 2013 and 2014 – ME/AE 455 – Mechanical Vibrations and Control – Class Strength – 120

Spring 2014 – ME/AE 201 – Intro to Experimental Methods Lab – Class Strength – 216

Fall 2015, 2016 and 2017 – ME 301 – Mechanical Engineering Lab – Class Strength – 216

Spring 2015, 2016 and 2017 – AE 401 – Advanced Aeronautical Engineering Lab – Class Strength – 54

## **STUDENT MENTORING**

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Clarkson University:

- Xioachi Xu, Ph.D. student (2015 – 2017)
- Zachary Cleland, Undergraduate student (2015 – 2017)
- Patrick Karmis, Undergraduate student (2016 – 2017)
- Tj Beaumier, Undergraduate student, McNair Scholarship Program (2015 – 2017)
- Jesse Hight, Undergraduate student, McNair Scholarship Program (2014 – 2016)
- Jonathan Dobbs, Undergraduate student (2014 – 2016)

The Ohio State University:

- Antony George, Master's student (2018 - present)

## **AFFILIATIONS AND OTHER EXPERIENCE**

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- Graduate Student Advisor: 3D S.I.G (3D printing special interest group) at Clarkson University (2013 – 2017).
- Cultural Secretary: Friends of India (FIA) association, Clarkson University (2015 – 2016).
- President: Friends of India (FIA) Association at Clarkson University (2013 – 2014).
- Vice President: Friends of India (FIA) Association at Clarkson University (2012 – 2013).
- Assisted the Department of Mechanical and Aeronautical Engineering, Clarkson University during Fall 2015 and 2016 student open house.
- Technical Secretary and Vice President for the Department of Aeronautical Engineering Fest at Vignan's Institute of Technology and Aeronautical Engineering – February 2011
- Co-Organizer: National Level Technical Workshop on Aerospace Engineering Perspectives on 21<sup>st</sup> August 2010 organized by the Department of Aeronautical Engineering (Vignan's Institute of Technology and Aeronautical Engineering) & Acoustical Society of India, Hyderabad Chapter
- National Cadet Corps (NCC), 'Certificate - A', Government of India.

## **REFERENCES**

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Professor. Cetin Cetinkaya (Ph.D. Advisor), [cetin@clarkson.edu](mailto:cetin@clarkson.edu), 315-268-6514

Department of Mechanical and Aeronautical Engineering, Clarkson University, Potsdam, NY

Professor. David Hoelzle (Postdoctoral supervisor), [hoelzle.1@osu.edu](mailto:hoelzle.1@osu.edu), 614- 688-2942

Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, OH

Professor. Ronald LaFleur, [rlafleur@clarkson.edu](mailto:rlafleur@clarkson.edu), 315-268-3823

Department of Mechanical and Aeronautical Engineering, Clarkson University, Potsdam, NY

Professor. Kevin Fite, [kfite@clarkson.edu](mailto:kfite@clarkson.edu), 315-268-3809

Department of Mechanical and Aeronautical Engineering, Clarkson University, Potsdam, NY