

The Food Oral Processing Research Laboratory at Zhejiang Gongshang University is newly established in response to growing interests and needs of food industry and consumers on the knowledge and skills on eating and sensory perception. The group is under the leadership of Dr. Jianshe Chen, a specially appointed professor at Zhejiang Gongshang University and an honorary professor at the University of Leeds.

The FOP research group at ZGU adopts integrated approaches to eating and sensory perception problems. The group has established expertise and facilities in food physics, oral physiology, and sensory psychology and applies multiple experimental techniques and methods to reveal the controlling dynamics of food oral breakdown and the governing principles of sensory perception to apply scientific understandings for technological advances of industrial food processing as well as the well-being of general public, in particular those disadvantaged populations (e.g. elderly, dysphagia patients, infants, etc). The research team currently has one professor, two post-doctoral researchers, one PhD student, two visiting PhD students, and a number of MSc students

The Food Oral Processing Research Laboratory at ZGU is a leading research laboratory equipped with state-of-the-art research instruments and equipment needed for research in food physics, oral physiology and sensory psychology.

**Food physics studies:** Texture analyser; high speed camera; thermal imaging camera; optical microscope; shear rheometer; CaBER extensometer, Malvern Mastersizer, Malvern particle tracker (Nanosizer), tribometer; etc.

**Oral physiology studies:** Electromyography; IOPI tongue strength measurement; Biting force measurement; Semmes-Weinstein Monofilaments (SWM) Touch Sense™ sensory evaluators; Tekscan sensor for oral pressure profiling.

**Sensory studies:** a multi-functional sensory analysis laboratory

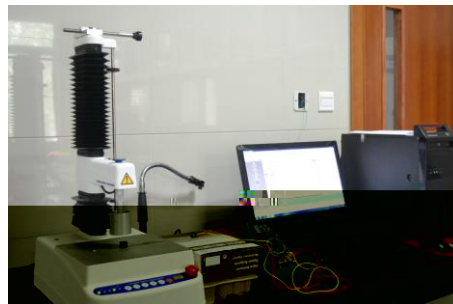
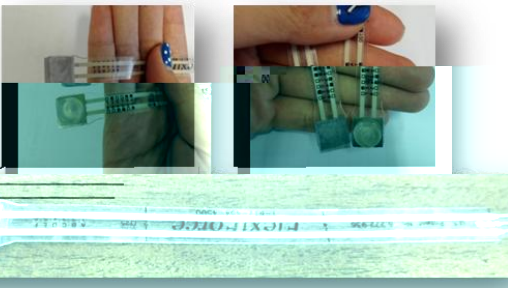


**Prof. Jianshe Chen** is a fellow of the Institute of Food Science & Technology (IFST) and a member of Food Group committee of the Royal Society of Chemistry. He serves as the editor-in-chief of the *Journal of Texture Studies* and editorial board member for other journals including *Food Structure*, *Food Digestion*, and etc. He was the organizer of the first international conference on *Food Oral Processing: Physics, Physiology, and Psychology of Eating* (July 2010) and serves as the convener to its scientific committee.

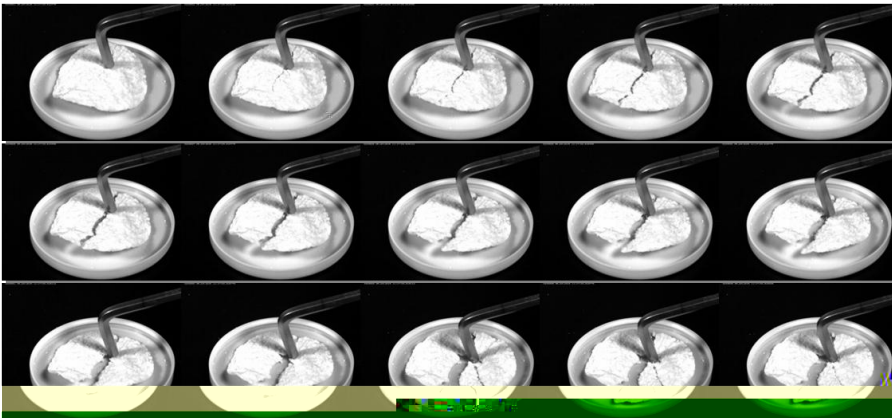
## RESEARCH AND INNOVATION

**Mouth behavior:** Ms. Gangying Zheng, a master student is currently working on a joint project with Plant and Food Research Institute, New Zealand, aiming to establish mouth behavior grouping of consumers. Feasible methodologies such as consumer insight, sensory testing (TDS, TI), EMG, biting force and tongue pressure have been developed for such purposes.

She has modified the very simple device for biting force measurement, i.e. Flexiforce force transducer, a sensor that can measure force up to 4000N. It can be related to resistance by the use of a multimeter. Different contact area will result in different electrical resistance. She used various materials for the disk and has come up with a suitable material which withstands the strong biting force. She is currently on a research exchange program to Plant and Research Institute, Christchurch, New Zealand.



Mr. Cong Lv has taken some interesting images of food breaking with the hi-speed imaging technique. For example: observing the fracture pattern of the chips. We hope that this data acquisition in time frame can provide us with visual information about the acoustic signatures of foods.



## OUR RESEARCH GROUP



## INVITED TALKS BY PROF. CHEN

Prof. Chen has been recently invited to give plenary talk at a number of international conferences, including

“From rheology to tribology, the underlying physical principles of oral textural sensation and perception”, 1<sup>st</sup> *SenseAsia Conference*, 11-13 May 2014, Singapore.

“Eating and food oral destruction: mechanisms and implications”, 1<sup>st</sup> *Food Structure and Functionality Forum Symposium*, 30 March – 2 April 2014, Amsterdam, the Netherlands.

“The oral dynamics of bolus formation and swallowing” at the 3<sup>rd</sup> *International Conference on Food Oral Processing*, 19 June-1 July 2014, Wageningen, the Netherlands.

“Flavor sensation and the food oral processing”, the 1<sup>st</sup> *Trends in Food Flavor International Conference*, 16-17 April 2015, Nottingham, UK.

“Assessment of the eating capability and the texture standardization of food for dysphagia patients”, the 4<sup>th</sup> *Dysphagia Forum*, 22-24 May 2015, Guangzhou, China.

“Controlling physical and physiological mechanisms on bolus swallowing and the design of food for elderly”, 12<sup>th</sup> *China Nutrition Science Congress*, 16-18 May 2015, Beijing, China.

“Food saliva interactions: mechanisms and implications”, the 3<sup>rd</sup> *Food Structure, Digestion and Health International Conference*, 28-30 October 2015, Wellington, New Zealand.

## INCOMING VISITS

During the past year, the research group has received a number of visits by industrial research scientists and academic researchers:

Dr. Isabelle Cayeux (Principal Scientist Human Perception & Bioresponses, Firmenich Geneva) and a group of Firmenich scientists: Dr. Olivier Haefliger (Director Analytical Innovation, Firmenich China), Dr. Xiao-Fen Du (Scientist Analytical Innovation, Firmenich China), Ms. Dan-Ting Yin (Assistant Scientist Sensory Analysis, Firmenich China, 13<sup>th</sup> November 2014.

Dr. Masahiko Nonaka and a team of research scientists of Ajinomoto of Japan, 20<sup>th</sup> November 2014.

Dr. Nicole Yang, University of Nottingham, Nov. 2014,

Dr. Guang Yan (Research Director), Dr. Tan Xueyan, Abbott, Jun 2014

Dr. Jack Chen (Research Director), DSM Shanghai, 17<sup>th</sup> December 2014

Dr. Yujun Li, Principal Scientist, P&G Research center, Beijing, March 2014

Dr. Christos Ritzoulis, ATEI of Thessaloniki, Greece, 9-15 March, 2015

Mr. Marco Morgenstern, Plant and Food Research Institute, Christchurch, New Zealand, 24-26 March 2015.

Ms. Natalia Brossard, visiting PhD student, Pontifical Catholic University of Chile, Sept. 2014 – Feb. 2015.

Mr. Pere Morell, visiting PhD student, Institute of Agrochemistry and Food Technology (IATA-CSIC), Valencia, Spain, Sept – Dec. 2015.

Prof. Susana Fiszman, Institute of Agrochemistry and Food Technology (IATA-CSIC), Valencia, Spain, 10-25 Oct. 2015.

Ms. Solange Sanahuja, visiting PhD student, Technical University of Munich, Germany, Oct. – Dec. 2015.

## RESEARCH COLLABORATIONS

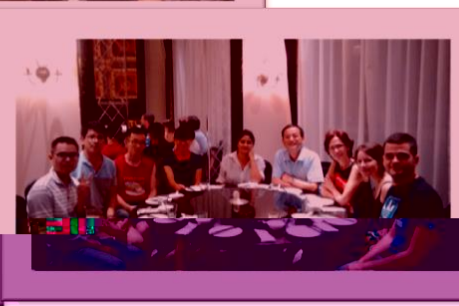
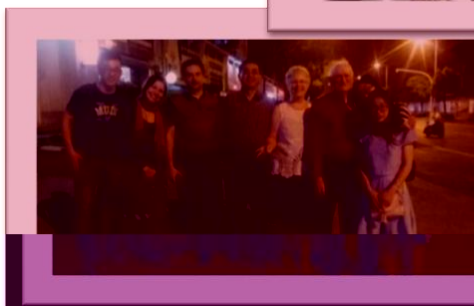
A number of joint research projects have been set up in the past year

“Lubrication studies for oral-care products” with P&G (Beijing Research Centre)

“Optimized food for elderly” with University of Leeds, UK.

“Oral physiology studies and eating behaviour among Chinese and New Zealand consumers” Plant and Food Research Institute, Christchurch, New Zealand

“A framework strategy for cross-national collaboration on food oral processing: Chilli perception, a case study” with the University of Nottingham.



## STUDENT ACTIVITIES AND RESEARCH

Ms. Huifang Cai was selected as an exchange student with the Kagawa University, Japan. Her activities include exchange of cultures, industrial visits such as Ajinomoto Co., Inc. and food safety and experimental studies.

Mr. Zhihong Lv will be working closely on specifically formulated for safe eating and swallowing of dysphasia patients and some elderly people.

Ms. Mingsong Su has recently joined as a master student and will be working on the dynamics of oral conversion of food particles to form a bolus; the properties and essential features of a food bolus; and the sensory ease of bolus swallowing.

Ms. Xia Hu is doing her occupational PhD and is a teacher at the Wenzhou Science and Technology Vocational College. The current focus is on how salivary enzyme interacts with food components and implications to sensory perception.

Dr. Rutuja Upadhyay, research focus will be on the lubrication behaviour of fluid foods and food/saliva mixture and its correlation with oral experience of such systems.

Dr. Carol Mosca aims to understand how human converts sensory stimuli and interpret received stimuli into perception

Mr. Bo Yuan, a new master student will be working on a project to investigate oral salivation and food-saliva interactions.

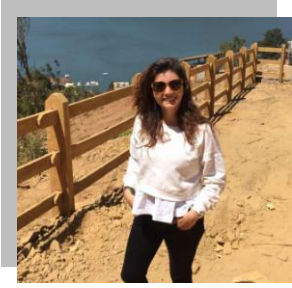
Mr. Cong Lv has recently joined the group as a master student aiming to reveal impact of spice stimuli on tactile sensitivity of tongue surface.



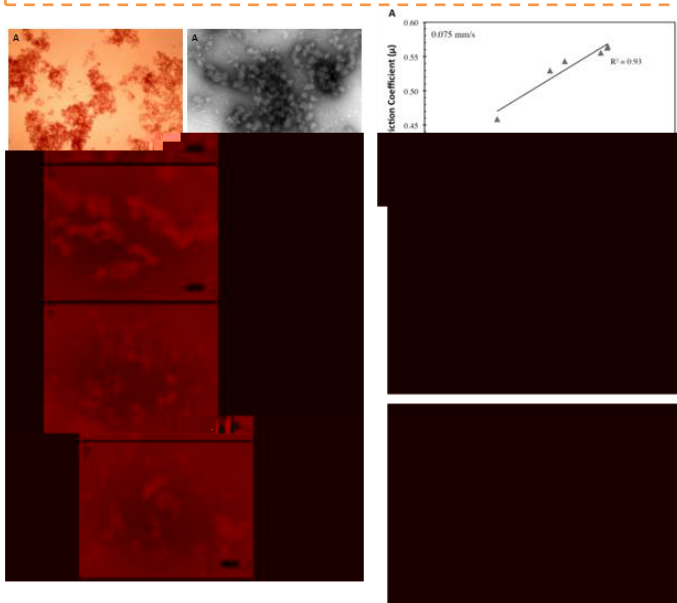


## STUDIES ON ASTRINGENCY

Ms. Natalia Brossard, a visiting PhD student from Pontifical Catholic University of Chile used tribological system to mimic the oral cavity to determine astringency of red wines. By comparing the friction coefficient with the human sensory results of astringency, a positive correlation between the two factors was established. Her work is also been accepted as a publication in the *Journal of Texture Studies*.



Polyphenol-saliva interactions along with the correlation between friction coefficient and sensory evaluation



## NEWS & EVENTS

Food for Elderly International Conference Oct. 15-17 2015, School of Food Science and Biotechnology, ZJGSU, Hangzhou, China.

Session 1: Physiological aspects of eating and swallowing among elderly populations

Session 2: Elderly eating and food physics

Session 3: Sensory psychology of elderly eating

Session 4: Elderly nutrition

Session 5: Texture modification and design for food for elderly

Session 6: Challenges and opportunities for food industry

4<sup>th</sup> International Conference on Food Oral Processing, "Food Oral Processing through life: interplay between food structure, sensory, pleasure and nutritional needs" July 3-6, 2016 at the SwissTech Convention Center in Lausanne, Switzerland

## RECENT PUBLICATIONS



- Chen, J. & Rosenthal, A. (2015) *Modifying Food Texture*, Vol. 1. Novel Ingredients and Processing Techniques. Woodhead, Cambridge.
- Chen, J. & Rosenthal, A. (2015) *Modifying Food Texture*, Vol. 2. Sensory Analysis, Consumer Requirements and Preferences. Woodhead, Cambridge.
- Upadhyay, R., Brossard, N. & Chen, J.\* (2015). Mechanisms underlying astringency: an tribology approach. *Journal of Physics D*. In press.
- Brossard, N., Cai, H., Osorio, F., Bordeu, E. & Chen, J.\* (2015). "Oral" tribological study on the astringency sensation of red wines. *Journal of Texture Studies*, In press.
- Laguna, L., Sarkar, A., Artigas, G. & Chen, J. \* (2015). A quantitative assessment of the eating capability in the elderly individuals. *Physiology and Behaviour*, In Press <http://authors.elsevier.com/sd/article/S0031938415002590>
- Laguna, L., Aktar, T., Ettelaie, R., Holmes, M. & Chen, J.\* (2015). Physiological capabilities of eating and effects of ageing. *Physiology and Behaviour*, submitted. 2015
- Aktar, T., Chen, J.\*, Ettelaie, R. and Holmes, M. (2015). Tactile sensitivity and the capability of texture discrimination. *Journal of Texture Studies*, In Press.
- Chen, J. (2015) Food oral processing: mechanisms and implications of food oral destruction. *Trends in Food Science and Technology*, Accepted.
- Cruanes, L.L. and Chen, J.\* (2015) The eating capability: definition and quantification. *Food Quality and Preference*, online accessible.
- Chen, J. (2015) Integration to a continuous success, an editorial. *Journal of Texture Studies*, 47, 2.
- Alsanei, W.A., Chen, J.\* and Ding, R. (2015). Food oral breaking and the determining role of tongue muscle strength. *Food Research International*, 67, 331-337.
- Steele, C. M.\*, Alsanei, W. A., Ayanikalath, S., Barbon, C. E. A., Chen, J., Cichero, J. A. Y., Coutts, K., Dantas, R. O., Duiveststein, J., Giosa, L., Hanson, B., Lam, P., Lecko, C., Leigh, C., Nagy, A., Namasivayam, A. M., Nascimento, W. V., Odendaal, I., Smith, C. H. & Wang, H. (2015). The influence of food texture and liquid consistency modification on swallowing physiology and function: A systematic review. *Dysphagia*, 30, 2–26. DOI 10.1007/s00455-014-9578-x.
- Chen, J.\* (2014). Food oral processing: some important underpinning principles of eating and sensory perception. *Food Structure*, 1, 95-105. DOI: 10.1016/j.foostr.2014.03.001
- Chen, J.\*, Liu, Z. and Prakash, S. (2014). Lubrication studies of fluid food using a simple experimental set up. *Food Hydrocolloids*, 42, 100-105. DOI 10.1016/j.foodhyd.2014.01.003.
- Alsanei, W.A. and Chen J.\* (2014). Studies of the capability of bolus swallowing: the maximum tongue pressure, the bolus size and the bolus consistency. *Journal of Texture Studies*, 45 1-12. DOI: 10.1111/jtxs.12042.

## GRANT INFORMATION:

Grants and scholarships are available for the postdoctoral researchers and PhD students. For details, please contact us.

## CONTACT DETAILS: Prof. Jianshe Chen

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