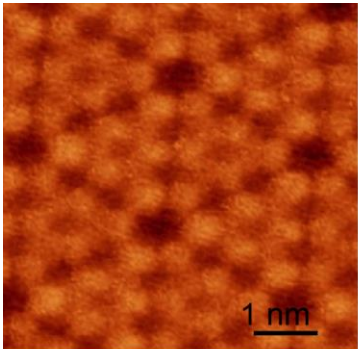
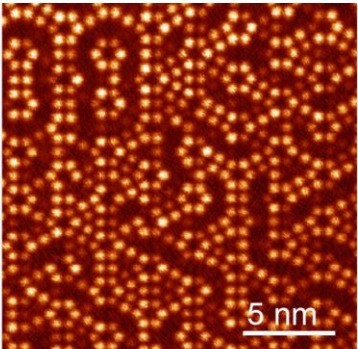
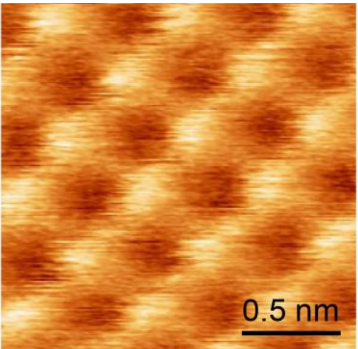


Division of Mathematical and Physical Sciences	Research field	Nano Physics	Lab. ID
			MP08
Laboratory web site	http://nanophys.w3.kanazawa-u.ac.jp/		
Research subjects			
<p>Nanophysics is a research field that aims at discovery of new physical phenomena by observation, analysis and control of quantum mechanical phenomena between individual atoms and molecules in solid states as well as at explorative development of novel technologies using the phenomena. In our nanophysics laboratory, we develop scanning probe microscopes (scanning tunneling microscope (STM) and atomic force microscope (AFM)) with novel features, and explore nanoscale phenomena by observing and analyzing sample surfaces with atomic resolution, while developing novel nanoscale evaluation methods. From a fundamental scientific question of "How do atoms arrange on solid surfaces and react each other?" to applied science of bottom-up nanotechnology to fabricate novel quantum effect devices by assembling atoms and molecules, we challenge to find the answers and to build up the technology in untrodden fields. The figures below show atom-resolved images of sample surfaces observed in our laboratory using our developed microscopes.</p>			
			
nc-AFM image of a Si(111)7x7 surface in ultrahigh vacuum (UHV)	Current image of an NH ₃ adsorbed Si(111)7x7 surface in UHV	FM-AFM image of a KBr(100) surface covered with an ultrathin water layer in ambient atmosphere	
Master/Doctor course: Education policy, curriculum, typical activity in the laboratory			
<p>Nanophysics is a new discipline originated from solid state physics and surface science. In our group seminar, the students in turn read and explain textbooks on surface science and so on (in English or Japanese), and present scientific papers on the topics related to their research theme.</p> <p>The paper presentations by students in domestic and international conferences are strongly recommended. It is necessary for doctoral students to present their papers in scientific journals and international conferences. The master course students also should aim at presentation of their papers in the international conferences.</p>			
Daily life in the laboratory, etc.			
<p>The students are basically requested to regularly study in our laboratory in weekdays. The graduate students should keep their time with awareness by themselves. Some students can carry out their research at other universities or institutes. For example, now in 2015, a doctoral student is studying abroad for about one year at Regensburg University in Germany.</p>			
Message or comments by the laboratory faculty staffs			
<p>The students first build the basics to study by utilizing their knowledge learned in their undergraduate courses. I hope that active students join to our laboratory, who want to challenge unexplored research.</p>			
Recent Master theses in these 3 years (+ more if appropriate)			
year.month	Thesis title (including English translation of Japanese thesis title)		
2017.3	Investigation of the energy dissipation mechanism detected with non-contact atomic force microscopy		
2017.3	Atom-resolved imaging of solid surfaces covered with a thin water film by Frequency Modulation Atomic Force microscopy		
2017.3	Development of Low temperature Scanning Tunneling Microscope/Non-contact Atomic Force Microscope in Ultrahigh Vacuum		
2017.3	Improvement of a force detection system for a non-contact atomic force microscopy and imaging of Si(111)7x7 surface reconstruction		
2016.3	Analysis of electronic conductance and mechanical response of Au nanocontact		
2015.3	Development of low temperature ultrahigh vacuum scanning tunneling microscopy/spectroscopy		
2015.3	Atom-resolved imaging on alkali halide surfaces by using frequency modulation atomic force microscope		
2015.3	Study of molecule-adsorbed silicon surfaces by ultrahigh vacuum noncontact atomic force microscopy		

2015.3	Growth of tungsten oxide nano-wires
2014.3	Atom-resolved imaging by frequency modulation atomic force microscope in ambient conditions
2014.3	Development of a low temperature ultrahigh vacuum scanning tunneling microscope, and preparation and analysis of a scanning tip
2013.3	Nano-scale surface analysis by ultrahigh vacuum noncontact atomic force microscopy/spectroscopy
2013.3	Development of ultrahigh vacuum noncontact atomic force microscopy using a quartz tuning fork as a force sensor
Recent Doctoral theses in these 3 years (+ more if appropriate)	
year.month	Thesis title (including English translation of Japanese thesis title)
2016.3	Development of non-contact atomic force microscopy with a retuned fork force sensor based on a quartz tuning fork
Laboratory mail address	Toyoko Arai <arai *at* staff.kanazawa-u.ac.jp>