

Principal Researcher	Toshio Ando			Number of Reserchers	1	
Research Institution • Department • Title	Professor, Graduate School of Natural Science and Technology, Kanazawa University			Location of Institution	Kanazawa	
Title of Project	Development of a highest-speed atomic force microscope and elucidation of the nano-structural dynamics of biological molecular motors					
Abstract of Research Project	<p>Key information that is lacking in understanding the physics of biomolecular machines is their structural dynamics. To gain the structural dynamics of protein experimentally, a technique that has high spatial resolution as well as effective temporal resolution is most required. In 2001 we developed for the first time a high-speed AFM that can capture a 100x100 pixel image within 80 ms. Its ability, high spatiotemporal resolution, has never been attained by other techniques. Hence, this AFM is the apparatus that life science has longed for. In the present study we enhance the capability of the high-speed AFM, making it possible to capture the dynamic behavior of biological molecular motors when they are functioning in solution. We, thereby, pioneer the way to a new nano-biology. What structural changes are driven by ATP hydrolysis? How are motor proteins behaving while moving along their tracks and producing force? Their images are captured at 50 frames/s and in 2-3 nm spatial resolution. From the very clear AFM images of the moving motors, we elucidate the mechanism by which motor proteins perform their functions. The highly resolved motion pictures must be able to tell us definitely what structural changes make the motor functions possible.</p>					
References	<p>Ando, T., N. Kodera, E. Takai, D. Maruyama, K. Saito & A. Toda, A high-speed atomic force microscope for studying biological macromolecules., <i>Proc. Natl. Acad. Sci. USA</i> 98:12468-12472 (2001)</p> <p>Ando, T., N. Kodera, D. Maruyama, E. Takai, K. Saito & A. Toda, A high-speed atomic force microscope for studying biological macromolecules in Action. <i>Jpn. J. Appl. Phys.</i> 41:4851-4856 (2002)</p>					
Term of Project	Fiscal years 2003-2007 . (5years)					
Budget Allocation (in thousand of yen)	FY2003	FY2004	FY2005	FY2006	FY2007	TOTAL
	16,900	16,300	14,800	11,100	11,100	70,200
Homepage Address	http://www.s.kanazawa-u.ac.jp/phys/biophys/index.htm					