

# FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

**Project Title:** Construction of interfacial microbial processes based on the functions of bacterionanofiber proteins

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## 1. Background of research

I discovered adhesive bacterionanofibers which microorganisms produce to adhere to surfaces like a spider's thread. These proteinaceous fibers are molecules with unique structure and show the highest level of adhesiveness in the world. However, the mechanism of the adhesion has been unrevealed.

## 2. Research objectives

A purpose of this research project is to immobilize microorganisms which produce useful chemicals, such as bio-ethanol and intermediary chemicals for the production of fine chemicals and plastics, using bacterionanofibers, and to utilize the immobilized microorganisms for chemical reactions. Another purpose is to grow functional nanofibers on microbial cells by fusing bacterionanofiber proteins with peptides adsorbing rare metals, enzymes catalyzing chemical reactions, and so on. For these purposes, the mechanism of adhesion and properties of the nanofibers are investigated in a molecular level.

## 3. Research characteristics (incl. originality and creativity)

If the function of a novel protein is discovered, understood in terms of the molecular mechanism, and used in new practical applications, the study might be worth a Nobel Prize like a green fluorescent protein (GFP) from *Aequorea Victoria*. In this study, I am aiming at revealing the function and mechanism of adhesive proteins that I have discovered, utilizing them in new application fields, and developing new proteinaceous materials which surpass GFP in usefulness. Similar proteins to the nanofibers have never been studied.

## 4. Anticipated effects and future applications of research

If microorganisms become able to be immobilized onto supports, we become able to produce chemicals efficiently using the microorganisms under environmentally friendly conditions, expecting the reduction of carbon dioxide emissions from chemical industry. In addition, we can expect to improve the productivity of biofuels and to establish energy saving technologies for recovery of rare metals from sea water and waste water using microorganisms.