

# Biomechatronics: How much biology does the engineer need?

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The historically well-founded strategy of biological inspiration of the process of technical development (“bionics”, JE Steel 1960) is more than ever a concept well acceptable for most engineers. Everyone plans to do so, but only a few at last really do.

Analysing our own experiences with bionic projects, we tried to identify why “all-days-life engineering” does not make use of bionics. In our presentation, we use the report on the process of bionic inspiration of mammalian-like walking machines (bipedal and quadruped) mainly as a vehicle to identify items necessary to make biologists and engineers not only work together but to really interchange. The usual idea that biologists only need to be offered areas of technical application of the biological principles they identify – “Technical Biology” – in our opinion is too short ranging. Analysing the sciences established in the range between biology and engineering (cf. fig.), the current problems of missing economic success of bionics, the decreasing interest in functional morphology, and the story of success of sports biomechanics and biomedical engineering seems to teach the following:

One condition sine qua non for success indeed is the access to a field of application. But more important is a condition, which in its core is based in psychology: the one to apply the biological principles in techniques is the one to pose the scientific question. Otherwise biology offers solutions no engineer has current interest in. The consequence we drew is that we have to teach engineers how to pose questions to biologists (and physician as “applied biologists”) in a correct terminology and in a style indicating basic knowledge about and interest in biology. We offer to our students of mechatronics a specialisation in “biomechatronics”. In extension of the use of this term at M.I.T. and the University of Twente we not only aim at the application of mechatronics in biomedical engineering, but extend the definition to: Biomechatronics is using biomedical knowledge for the development and optimisation of mechatronic systems. This covers bionics (biology for engineering) as well as biomedical engineering and its relatives (engineering for biology). The reason for the extension of the area of interest is our conviction that inspiration and application should be linked together in education as well as in science.

