

# Integrating Knowledge From Biology Into The TRIZ Framework

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*“During WW1, the (Soviet) Navy started using hydrophones to listen and identify submarine propellers. These hydrophones could be used only when the ship was stopped or moving very slowly. Otherwise, sounds generated by water flow at the hydrophone inlet were overwhelming. One engineer working on improvement knew that hearing of seals was not impaired by their fast motion. This engineer suggested hydrophone designs whose inlet was shaped as ear cavity of seal. As a result, the performance improved significantly and hydrophones could be used when the ship was moving”*

(Translated from Reference 1)

We are pleased to announce that the University of Bath has been successful in acquiring support funding from one of the UK University research funding bodies to carry out a programme of work to integrate knowledge from the biological and biomimetic sciences into the TRIZ framework.

The work brings together the Universities combined expertise in the areas of TRIZ and biomimetics. Indeed, Professor Vincent is one of the world’s most eminent scholars in the biomimetics arena, initially coining the term biomimetics, and subsequently producing a stream of papers, articles in the popular press and television, as well as several monographs on the subject.

The programme of research will fund three researchers for a period of three years each.

The work is intended to be complementary to the previous and current high quality work by other researchers in this field (see for example References 1, 2), and is expected to be made available to the TRIZ community via a range of media. Included in these will be regular updates in TRIZ Journal, a series of papers to be published in academic journals and, ultimately, the production of a monograph.

Anyone who has worked in this arena is welcome to contribute to the programme (if we know of your work, chances are we will have contacted you already). Our aim is to benefit all TRIZ users by codifying as much of nature’s good design practice into the TRIZ philosophy. Our efforts will span the breadth of TRIZ, but will offer specific focus in the following areas:-

1. Contradictions - What contradictions has nature successfully resolved? What Inventive Principles has she used to achieve the resolution? Our aim is build on our initial work in this area (3, 4) to produce an updated version of the TRIZ Contradiction Matrix - probably with a revised list of improving and worsening parameters.

2. Trends of Evolution - Has nature followed the TRIZ trends? Does it know any more that we haven't uncovered yet? Can we extract knowledge from biological evolution to enhance the existing TRIZ technology evolution trends
3. Knowledge/Effects - classification of knowledge in terms of 'function' is commonplace in biology. Our intention here is to fit existing biological knowledge into the TRIZ functional classification schema, as well as expanding this database to include the very large number of biological solutions which have not yet been analysed.
4. Resources - nature is an extremely effective user of resources. In terms of achieving the maximum from the minimum resource, we have much to learn from nature's 4 billion years worth of experience. We aim to abstract and codify nature's use of resources into a format accessible to problem solvers from all sectors.

In order to maximize our effectiveness and allow input access from the widest possible range of parties working in this field, we have created a web-site containing means by which everyone can contribute to the research. This will work on two levels. At the simplest level, we are posting a simple 'idea' button for anyone with a desire to direct us towards any 'good' nature solution that they feel should be included (e.g. 'what about including the butterfly that is able to change the colour of it's wings?'). At a more comprehensive level, for the serious worker in the field, we are providing an input format like that shown in the following figure:

# Systematic Knowledge Capture

Welcome to the University of Bath biology knowledge capture web-site. We are currently embarked upon a major project to capture biological knowledge in a form that makes it accessible to scientists and engineers from all other disciplines to the mutual benefit of all.

We are using the functionally classified knowledge framework provided by the systematic innovation method, TRIZ. You don't need to know anything about TRIZ to help with our work (anyone that wants to, however, we suggest you look [here](#)) as that's something the project team here at Bath will worry about.

It is our aim to make the knowledge incorporated into the project database available to all. The more everyone puts in, the more everyone will get out.

We have tried to make the input format as simple and easy as possible to minimise your effort. You have two choices. Choice 1 means you know of a piece of useful knowledge and would like us to analyse it and introduce it into the database. This is option 'SIMPLE'. Choice 2 means you'd like to see our database structure and contribute directly into the database. This is option 'FULL'.

If there is anything you don't understand, please feel free to leave blank and we'll fill in the gaps.

For the purposes of knowledge tracking and quality control, each input suggestion will be given a unique reference number. Users may like to keep a record of this number if they'd like to track how their inputs are turned into official database knowledge. Names of contributors are always welcomed, but please feel free to remain anonymous if you'd rather.

Many thanks in anticipation for your help.



**Figure 1: Knowledge Input ProForma**

(All inputs will, of course, be subjected to rigorous academic scrutiny before being formally accepted into the overall project knowledge framework in order to ensure a necessary consistency.)

- Interested parties are invited to check out the project web-site at [www.bath.ac.uk/Departments/Eng/biomimetics/](http://www.bath.ac.uk/Departments/Eng/biomimetics/)

## Beneficiaries

The work is aimed at achieving mutual benefit between TRIZ users and biologists. As far as the 'TRIZ community' is concerned, we hope everyone will find something useful in what we are doing. In terms of this month's special issue on the food industry, we hope there will be specific and tangible benefits to researchers and workers operating in one of the industries operating in close proximity with the biological sciences.

## References

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3. Murashkosky, J., Bukhalov, V., 'Inventing A Turtle', privately printed in Russian, 1993.
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5. Vincent, J.F.V., Mann, D.L., 'Systematic technology transfer from biology to engineering', paper to be published in Philosophical Transactions A, Autumn 2001.

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