

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/365992839>

# Function: the concept that (almost) everyone uses... but no one really knows – and why it matters

Presentation · September 2022

DOI: 10.13140/RG.2.2.24173.26083

---

CITATIONS

0

READS

39

1 author:



Alberto Molina-Pérez

University of Granada

76 PUBLICATIONS 311 CITATIONS

SEE PROFILE

---

***Function***: the concept that (almost) everyone uses... but no one really knows - and why it matters

Alberto Molina Pérez  
*Institute for Advanced Social Studies*  
*Spanish National Research Council*  
(IESA-CSIC)





## Background

- Open debate since 1970s, hundreds of papers and books from both biologists and philosophers
- “Old school biology”: almost no Molecular Biology, no SynBio, no BioEngineering
- No consensus about what biological functions are / what this concept means
- Medical doctors seem not to use the same concept of function as biologists



Uses of *function* or *function·al·ity* and related terms  
and expressions: *design, in order to, for...*



## Uses of *function* or *function-ality* and related terms and expressions: *design, in order to, for...*

10:30 - 10:50

**Didier MAZEL**

Bacterial Genome Plasticity, Institut Pasteur (France)

*Synthetic toxin-intein combinations as genetic weapons for specific killing of pathogenic bacteria in complex populations.*



## Uses of *function* or *function-ality* and related terms and expressions: *design, in order to, for...*

10:30 - 10:50

**Didier MAZEL**

Bacterial Genome Plasticity, Institut Pasteur (France)

*Synthetic toxin-intein combinations as genetic weapons for specific killing of pathogenic bacteria in complex populations.*

10:30 - 10:50

**Didier MAZEL**

Bacterial Genome Plasticity, Institut Pasteur (France)

*Synthetic toxin-intein combinations as genetic weapons for specific killing of pathogenic bacteria in complex populations.*

14:20 - 14:50

**Aude BERNHEIM**

U1284 SEED, IAME, INSERM (France)

*Genomics driven discovery of anti-phage systems.*

16:50 - 17:10

**Nicholas SOUTHERN**

Centre for Synthetic Biology, Technical University of Darmstadt (Germany)

*Photocaged Transcriptional Activators for Optogenetic Gene Expression Control*

09:30 - 10:00

**Alexis COURBET**

Institute for Protein Design, University of Washington (USA)

10:30 - 10:50

**Didier MAZEL**

Bacterial Genome Plasticity, Institut Pasteur (France)

*Synthetic toxin-intein combinations as genetic weapons for specific killing of pathogenic bacteria in complex populations.*

14:20 - 14:50

**Aude BERNHEIM**

U1284 SEED, IAME, INSERM (France)

*Genomics driven discovery of anti-phage systems.*

16:50 - 17:10

**Nicholas SOUTHERN**

Centre for Synthetic Biology, Technical University of Darmstadt (Germany)

*Photocaged Transcriptional Activators for Optogenetic Gene Expression Control*

09:30 - 10:00

**Alexis COURBET**

Institute for Protein Design, University of Washington (USA)

*Towards the computational design of genetically encodable nanomachines*





# function

noun



function | \ 'fʌŋ(k)-shən 



## Definition of *function* (Entry 1 of 2)

- 1** : professional or official position : [OCCUPATION](#)  
*//* His job combines the *functions* of a manager and a worker.
- 2** : the action for which a person or thing is specially fitted or used or for which a thing exists : [PURPOSE](#)
- 3** : any of a group of related actions contributing to a larger action  
*especially* : the normal and specific contribution of a bodily part to the economy of a living organism  
*//* The *function* of the heart is to pump blood through the body.
- 4** : an official or formal ceremony or social gathering  
*//* They went to several *functions* during their college reunion weekend.
- 5 a** : a mathematical correspondence that assigns exactly one element of one set to each element of the same or another set
- b** : a variable (such as a quality, trait, or measurement) that depends on and varies with another  
*//* height is a *function* of age  
*also* : [RESULT](#)  
*//* illnesses that are a *function* of stress
- 6** : characteristic behavior of a chemical compound due to a particular reactive unit  
*also* : [FUNCTIONAL GROUP](#)
- 7** : a computer subroutine  
*specifically* : one that performs a calculation with variables (see [VARIABLE entry 2 sense 1a](#)) provided by a program and supplies the program with a single result



## Uses of *function* or *function-ality*

- MATHS
- SOCIAL SCIENCES
- MEDICINE
- BIOLOGY
- CHEMISTRY (Organic)
- ENGINEERING
- COMPUTATION



## Uses of *function* or *function·al·ity*

- MATHS
- SOCIAL SCIENCES
- MEDICINE
- BIOLOGY
- CHEMISTRY (Organic)
- ENGINEERING
- COMPUTATION

No use for *function·al·ity* in:

✗ PHYSICS, CHEMISTRY

✗ Astronomy, Geology, Oceanography,  
Metereology, ...



## Uses of *function* or *function·al·ity*

- MATHS
- SOCIAL SCIENCES
- MEDICINE
- BIOLOGY
- CHEMISTRY (Organic)
- ENGINEERING
- COMPUTATION

No use for *function·al·ity* in:

✗ PHYSICS, CHEMISTRY

✗ Astronomy, Geology, Oceanography,  
Metereology, ...

Synthetic biology is at the crossroads of several of these disciplines



## Do these uses of *function* refer to the same concept?

Are **professional** functions, **mathematical** functions, and **chemical** functions the same thing?

Are **biological functions** (living beings) and **technical functions** (artifacts) the same thing?

→ Are they the *same concept* or *two different concepts* with the same name?



## Do these uses of *function* refer to the same concept?

Are **professional** functions, **mathematical** functions, and **chemical** functions the same thing?

Are **biological functions** (living beings) and **technical functions** (artifacts) the same thing?

→ Are they the *same concept* or *two different concepts* with the same name?



## Do these uses of *function* refer to the same concept?

Are **professional** functions, **mathematical** functions, and **chemical** functions the same thing?

Are **biological functions** (living beings) and **technical functions** (artifacts) the same thing?

→ Are they the *same concept* or *two different concepts* with the same name?

Most authors think they are entirely different things!



## Uses of *function* or *function·al·ity*

- MATHS
- SOCIAL SCIENCES
- MEDICINE
- BIOLOGY
- CHEMISTRY (Organic)
- ENGINEERING
- COMPUTATION

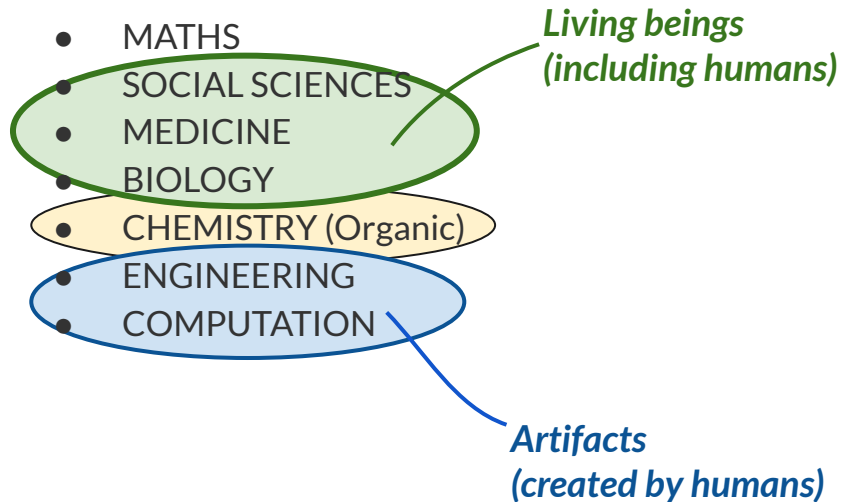
No use for *function·al·ity* in:

✗ PHYSICS, CHEMISTRY

✗ Astronomy, Geology, Oceanography,  
Metereology, ...



## Uses of *function* or *function·al·ity*



No use for *function·al·ity* in:

✗ PHYSICS, CHEMISTRY

✗ Astronomy, Geology, Oceanography,  
Metereology, ...



## ***Functions*** in biology are useful (?) to understand...

Origins of **LIFE**

Nature of **LIFE**

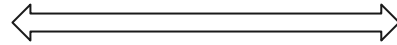
How **LIFE** works

End of **LIFE**



## ***Functions*** in biology are useful (?) to understand...

Origins of **LIFE**



Origins of biological **functions**

Nature of **LIFE**

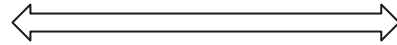
How **LIFE** works

End of **LIFE**



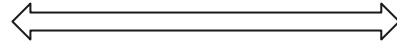
## ***Functions*** in biology are useful (?) to understand...

Origins of **LIFE**



Origins of biological **functions**

Nature of **LIFE**



Defined in **functional** terms

How **LIFE** works

End of **LIFE**



## ***Functions*** in biology are useful (?) to understand...

Origins of <b>LIFE</b>	↔	Origins of biological <b>functions</b>
Nature of <b>LIFE</b>	↔	Defined in <b>functional</b> terms
How <b>LIFE</b> works	↔	As interactions of <b>functions</b>
End of <b>LIFE</b>		



## ***Functions*** in biology are useful (?) to understand...

Origins of <b>LIFE</b>	↔	Origins of biological <b>functions</b>
Nature of <b>LIFE</b>	↔	Defined in <b>functional</b> terms
How <b>LIFE</b> works	↔	As interactions of <b>functions</b>
End of <b>LIFE</b>	↔	Cessation of <b>functions</b>



## Why are *functions* problematic?

- ❖ **Teleology**
  - Refers to consequences, ends, (i.e., future events), instead of causes
  - Refers to purposes, intentions (intelligent design)
  
- ❖ **Value-laden**
  - Good/bad
  - Normativity (what something *should* do)



## Why are *functions* problematic?

❖ Teleology

✓ ENGINEERING

✗ BIOLOGY

❖ Value-ladden

✓ ENGINEERING

✗ BIOLOGY





## Why are *functions* problematic?

❖ Teleology

✓ ENGINEERING

✗ BIOLOGY

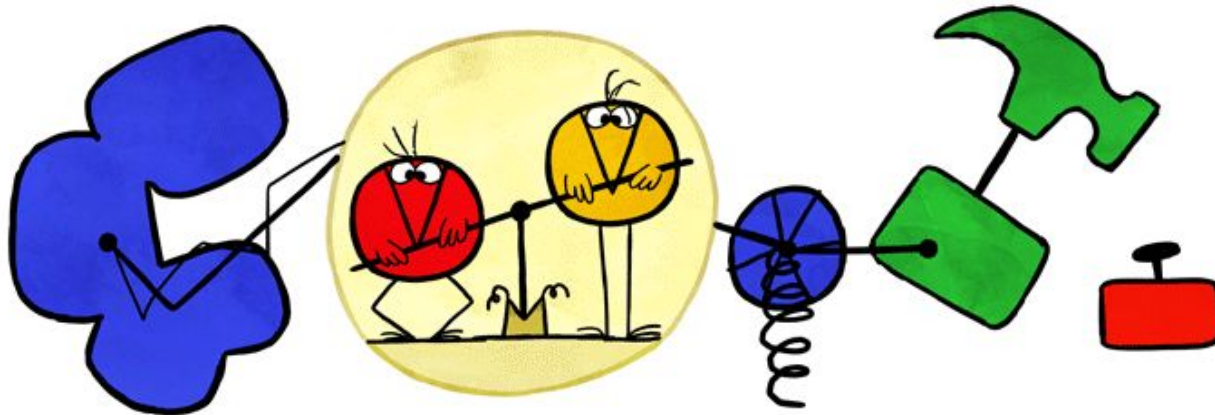
❖ Values

✓ ENGINEERING

✗ BIOLOGY

What happens with functions  
in **Synthetic Biology**?

—  
**Thank you!**



POURQUOI FAIRE SIMPLE QUAND ON PEUT FAIRE COMPLIQUÉ ?!