

Autumn 2024

# Lib4RI Training Series: Module 1 - Searching Scientific Information

Bobby Neuhold & Stephanie Hofmann

# Basic Search



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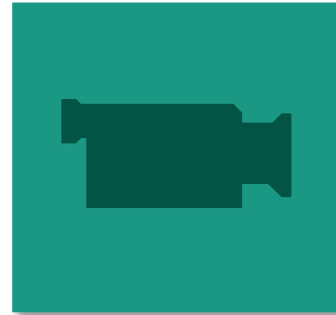
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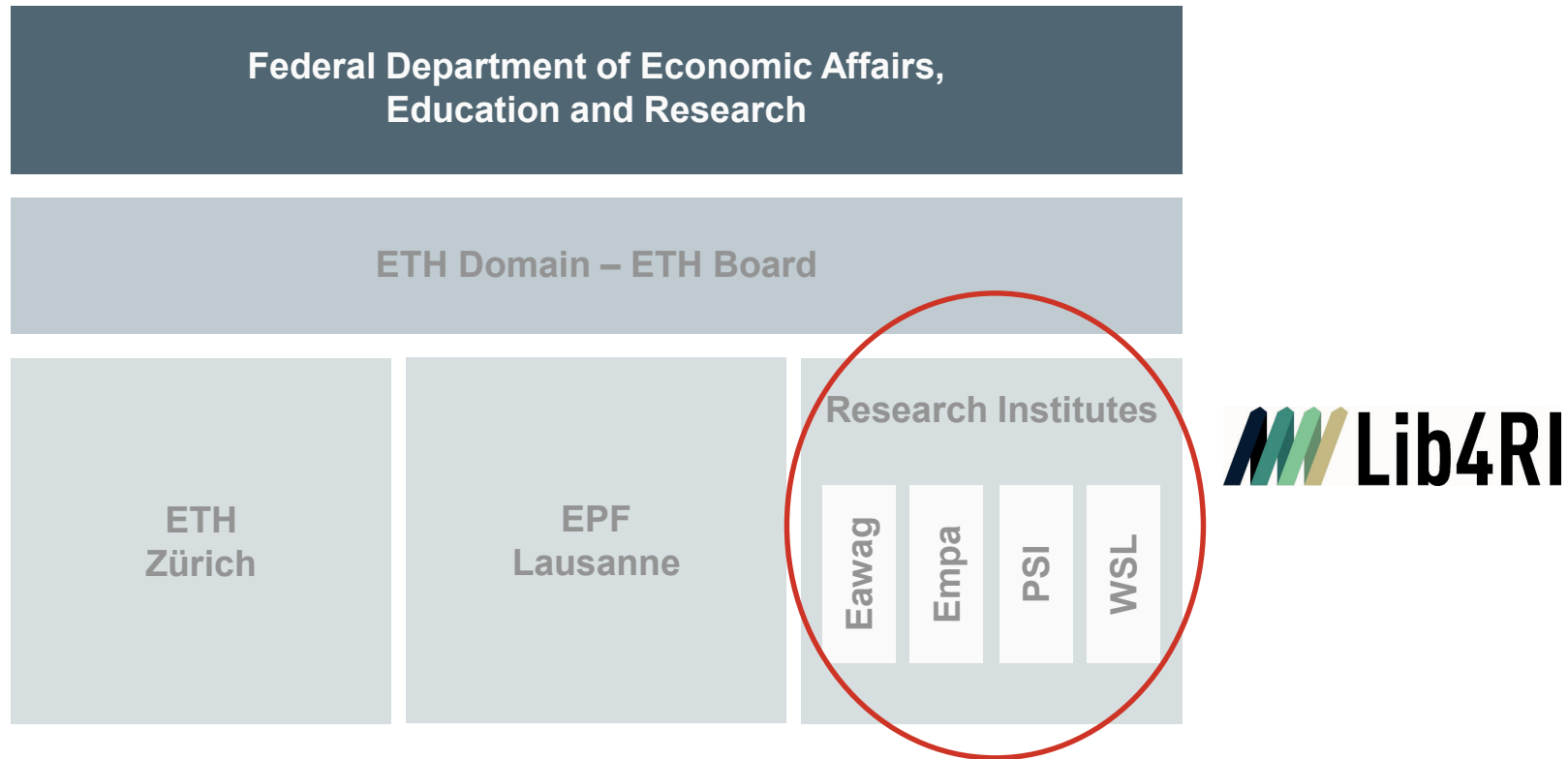


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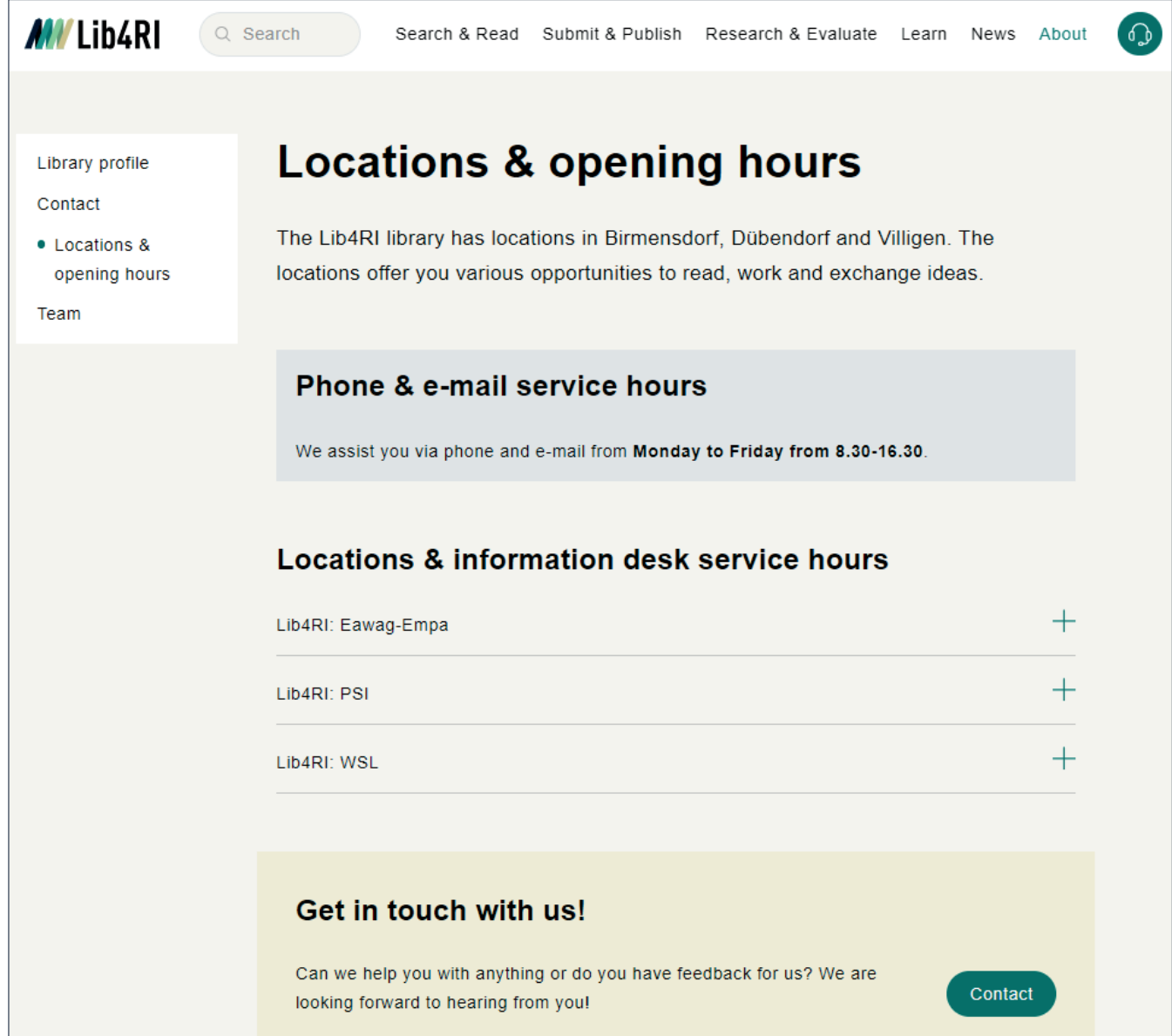
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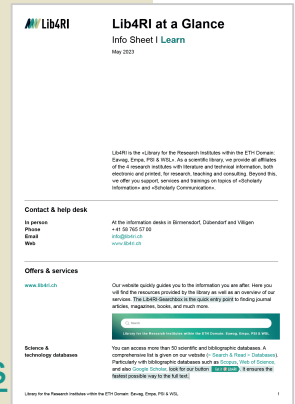
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## References

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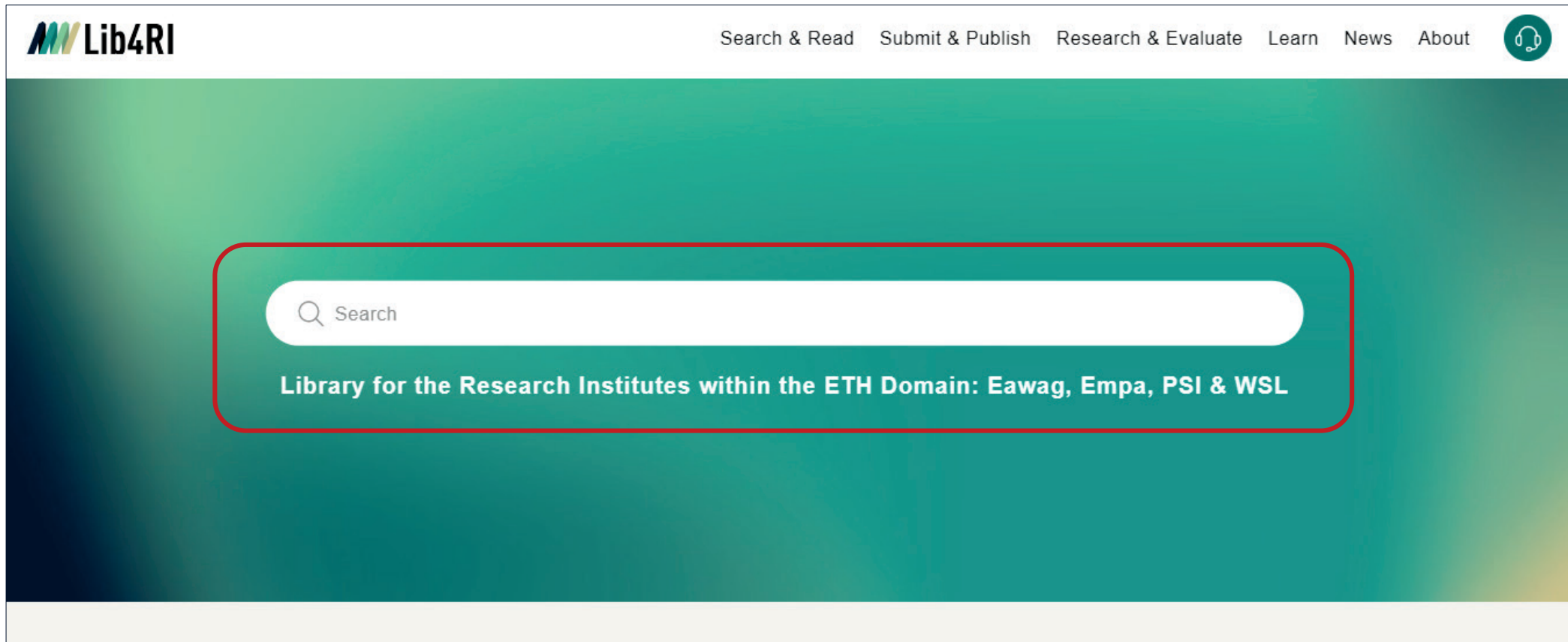
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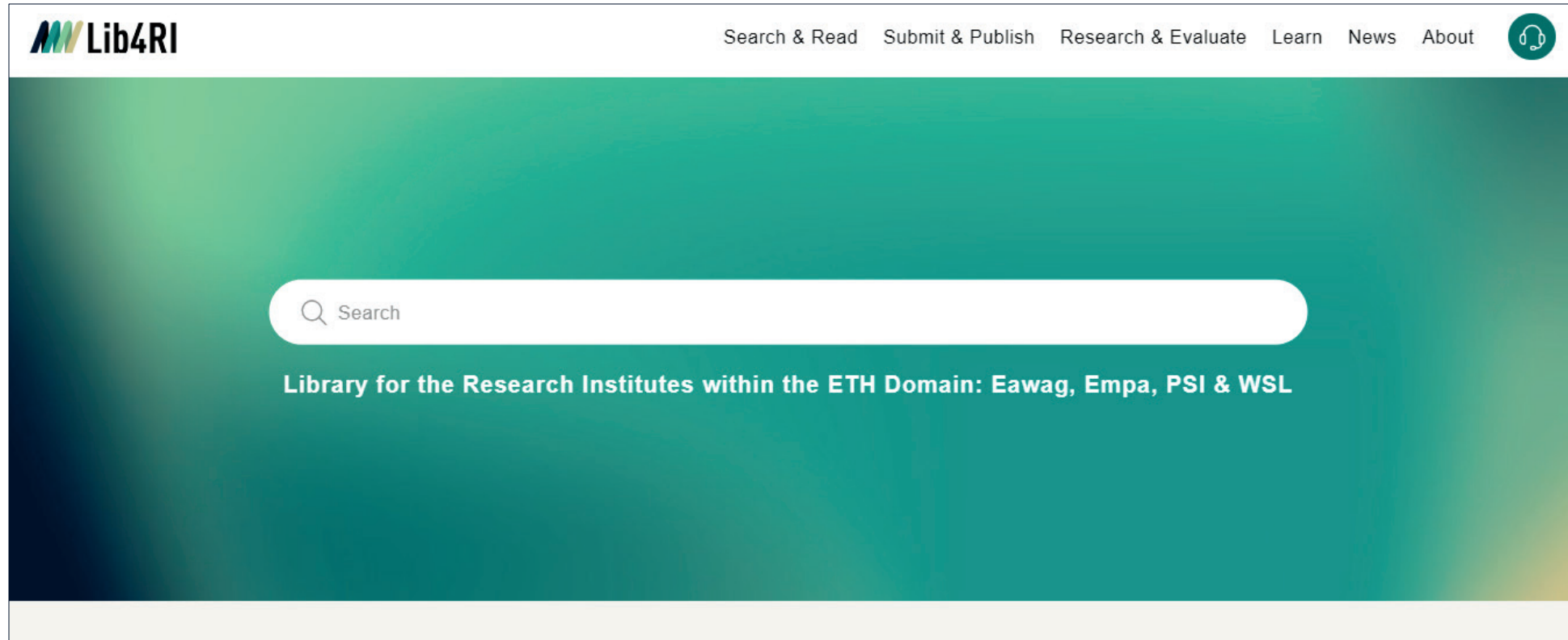
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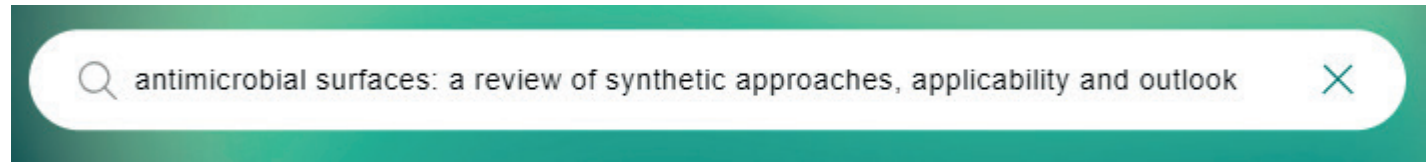
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**JOURNAL OF MATERIALS SCIENCE**

Volume: 56 Issue: 32 Page: 17915-17941  
DOI: 10.1007/s10853-021-06404-0  
Published: NOV 2021  
Early Access: AUG 2021  
Indexed: 2021-08-18  
Document Type: Review

**Abstract**

The rapid spread of microorganisms such as bacteria, fungi, and viruses can be extremely detrimental and can lead to seasonal epidemics or even pandemic situations. In addition, these microorganisms may bring about fouling of food and essential materials resulting in substantial economic losses. Typically, the microorganisms get transmitted by their attachment and growth on various household and high contact surfaces such as doors, switches, currency. To prevent the rapid spread of microorganisms, it is essential to understand the interaction between various microbes and surfaces which result in their attachment and growth. Such understanding is crucial in the development of antimicrobial surfaces. Here, we have reviewed different approaches to make antimicrobial surfaces and correlated surface properties with antimicrobial activities. This review concentrates on physical and chemical modification of the surfaces to modulate wettability, surface topography, and surface charge to inhibit microbial adhesion, growth, and proliferation. Based on these aspects, antimicrobial surfaces are classified into patterned surfaces, functionalized surfaces, superwettable surfaces, and smart surfaces. We have critically discussed the important findings from systems of developing antimicrobial surfaces along with the limitations of the current research and the gap that needs to be bridged before these approaches are put into practice.

**Keywords**

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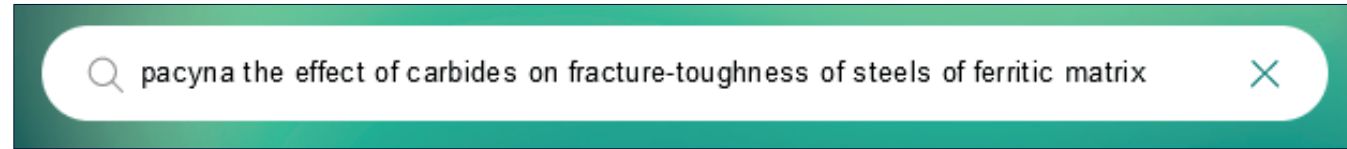
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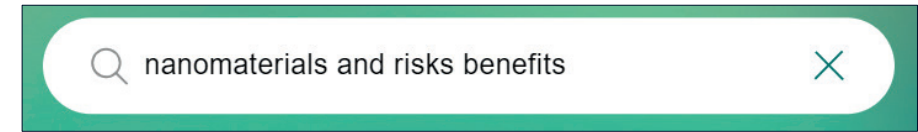
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- Brayner R et al. *Nanomaterials: A Danger or a Promise? : A Chemical and Biological Perspective*. Springer London; 2013.
- Bachheti RK, Husen A. *Nanomaterials for Environmental and Agricultural Sectors*. Springer Nature Singapore; 2023.
- Rai M, Biswas JK. *Nanomaterials: Ecotoxicity, Safety, and Public Perception*. Springer International Publishing; 2018.
- Bachheti RK et al. *Metal and Metal-Oxide Based Nanomaterials : Synthesis, Agricultural, Biomedical and Environmental Interventions*. Springer Nature Singapore; 2024.
- Rai M, Nguyễn TA. *Nanomaterials recycling*. Elsevier; 2022.
- Nalwa HS, Zhao Y. *Nanotoxicology : interactions of nanomaterials with biological systems*. American Scientific Publ; 2007.
- Puzyn T, Leszczynski J. *Towards efficient designing of safe nanomaterials : innovative merge of computational approaches and experimental techniques*. RSC Pub; 2012.
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
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- Mazumdar A. *Systems biogeochemistry of major marine biomes*. Wiley; 2022.
- Schink B. *Advances in Microbial Ecology*. Springer US; 2000.
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- Westbroek P, DeJong EW. *Biomining and biological metal accumulation : : biological and geological perspectives : : papers presented at the fourth International Symposium on Biomining, Renesse, the Netherlands, June 2-5, 1982*. D. Reidel Publishing Company; 1983.

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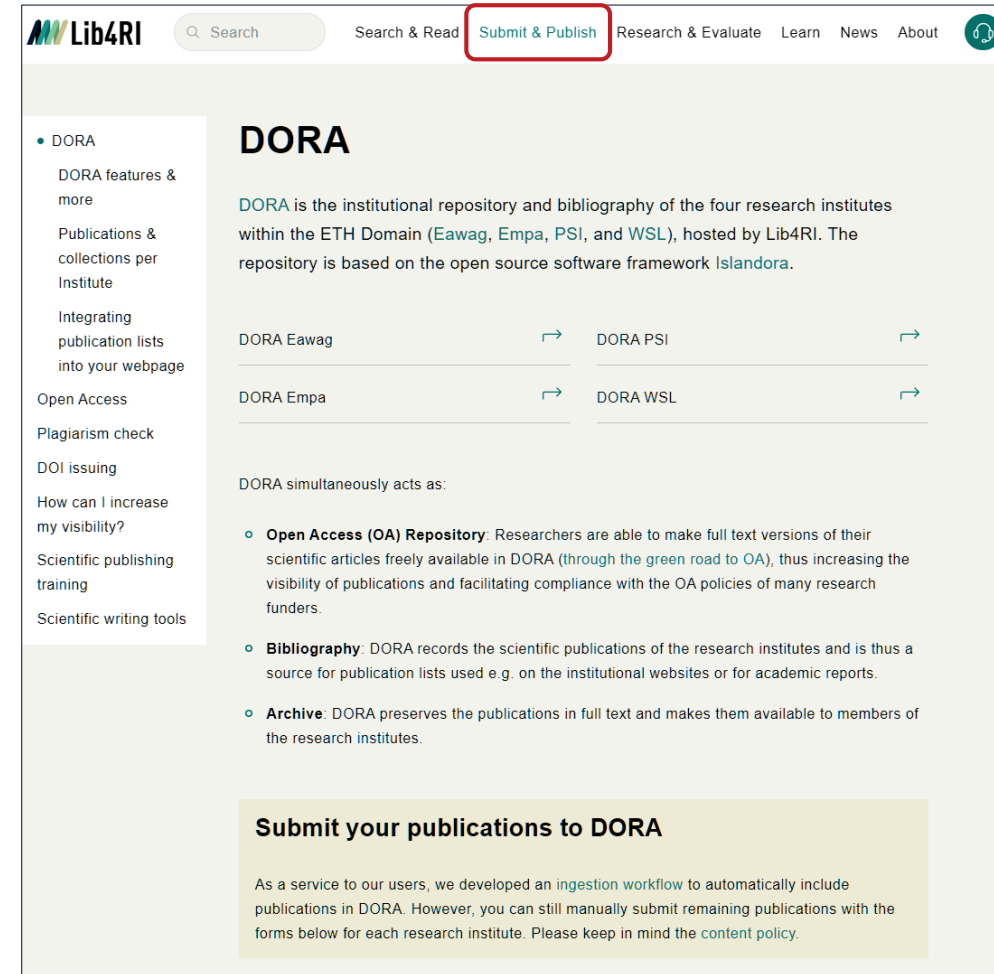
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Bath toys pose an interesting link between flexible plastic materials, potable water, external microbial and nutrient contamination, and potentially vulnerable end-users. Here, we characterized biofilm communities inside 19 bath toys used under real conditions. In addition, some determinants for biofilm formation were assessed, using six identical bath toys under controlled conditions with either clean water prior to bathing or dirty water after bathing. All examined bath toys revealed notable biofilms on their inner surface, with average total bacterial numbers of  $5.5 \times 10^6$  cells/cm<sup>2</sup> (clean water controls),  $9.5 \times 10^6$  cells/cm<sup>2</sup> (real bath toys), and  $7.3 \times 10^7$  cells/cm<sup>2</sup> (dirty water controls). Bacterial community compositions were diverse, showing many rare taxa in real bath toys and rather distinct communities in control bath toys, with a noticeable difference between clean and dirty water control biofilms. Fungi were identified in 58% of all real bath toys and in all dirty water control toys. Based on the comparison of clean water and dirty water control bath toys, we argue that bath toy biofilms are influenced by (1) the organic carbon leaching from the flexible plastic material, (2) the chemical and biological tap water quality, (3) additional nutrients from care products and human body fluids in the bath water, as well as, (4) additional bacteria from dirt and/or the end-users' microbiome. The present study gives a detailed characterization of bath toy biofilms and a better understanding of determinants for biofilm formation and development in systems comprising plastic materials in contact with potable water.

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- Roels E et al. Processing of self-healing polymers for soft robotics. *Advanced Materials* 2022. <https://doi.org/10.1002/adma.202104798>.
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## A review on self-healing polymers for soft robotics

Terryn S, Langenbach J, Roels E, Brancart J, Bakkali-Hassani C, Poutrel Q-A, Georgopoulou A, George Thuruthel T, Safaei A, Ferrentino P, Sebastian T, Norvez S, Iida F, Bosman AW, Tournilhac F, Clemens F, Van Assche G & Vanderborght B

**Citation** APA Terryn, S., Langenbach, J., Roels, E., Brancart, J., Bakkali-Hassani, C., Poutrel, Q. A., ... Vanderborght, B. (2021). A review on self-healing polymers for soft robotics. *Materials Today*, 47, 187-205. <https://doi.org/10.1016/j.mattod.2021.01.009>

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The intrinsic compliance of soft robots provides safety, a natural adaptation to its environment, allows to absorb shocks, and protects them against mechanical impacts. However, a literature study shows that the soft polymers used for their construction are susceptible to various types of damage, including fatigue, overloads, interfacial debonding, and cuts, tears and perforations by sharp objects. An economic and ecological solution is to construct future soft robotic systems out of self-healing polymers, incorporating the ability to heal damage. This review paper proposes criteria to evaluate the potential of a self-healing polymer to be used in soft robotic applications. Based on these soft robotics requirements and on defined performance parameters of the materials, linked to the mechanical and healing properties, the different types of self-healing polymers already available in literature are critically assessed and compared. In addition to a description of the state of the art on self-healing soft robotics, the paper discusses the driving forces and limitations to spur the interdisciplinary combination between self-healing polymer science and soft robotics.

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**Publication Type** Journal Article

**Title** A review on self-healing polymers for soft robotics

**Author(s)** Terryn, Seppe  
Langenbach, Jakob  
Roels, Ellen  
Brancart, Joost  
Bakkali-Hassani, Camille  
Poutrel, Quentin-Arthur  
Georgopoulou, Antonia (201 High Performance Ceramics)

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- Cui J et al. Nanomagnetic encoding of shape-morphing micromachines. *Nature* 2019. <https://doi.org/10.1038/s41586-019-1713-2>.

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## Nanomagnetic encoding of shape-morphing micromachines

Cui J, Huang T-Y, Luo Z, Testa P, Gu H, Chen X-Z, Nelson BJ & Heyderman LJ

**Citation** Cui, J., Huang, T. Y., Luo, Z., Testa, P., Gu, H., Chen, X. Z., ... Heyderman, L. J. (2019). Nanomagnetic encoding of shape-morphing micromachines. *Nature*, 575(7781), 164-168. <https://doi.org/10.1038/s41586-019-1713-2>

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Shape-morphing systems, which can perform complex tasks through morphological transformations, are of great interest for future applications in minimally invasive medicine, soft robotics, active metamaterials and smart surfaces. With current fabrication methods, shape-morphing configurations have been embedded into structural design by, for example, spatial distribution of heterogeneous materials, which cannot be altered once fabricated. The systems are therefore restricted to a single type of transformation that is predetermined by their geometry. Here we develop a strategy to encode multiple shape-morphing instructions into a micromachine by programming the magnetic configurations of arrays of single-domain nanomagnets on connected panels. This programming is achieved by applying a specific sequence of magnetic fields to nanomagnets with suitably tailored switching fields, and results in specific shape transformations of the customized micromachines under an applied magnetic field. Using this concept, we have built an assembly of modular units that can be programmed to morph into letters of the alphabet, and we have constructed a microscale 'bird' capable of complex behaviours, including 'flapping', 'hovering', 'turning' and 'side-slipping'. This establishes a route for the creation of future intelligent microsystems that are reconfigurable and reprogrammable in situ, and that can therefore adapt to complex situations.

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**Publication Type** [Journal Article](#)

**Title** Nanomagnetic encoding of shape-morphing micromachines

**Author(s)** Cui, Jizhai (3701 Mesoscopic Systems)  
Huang, Tian-Yun  
Luo, Zhaochu (3701 Mesoscopic Systems)  
Testa, Paolo (3701 Mesoscopic Systems)  
Gu, Hongri  
Chen, Xiang-Zhong  
Nelson, Bradley J.  
Heyderman, Laura J. (3700 Multiscale Materials Experiments)

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- o Ayala Álvaro et al. [Glacier runoff variations since 1955 in the Maipo River basin, in the semiarid Andes of central Chile. \*Cryosphere\* 2020.](https://doi.org/10.5194/tc-14-2005-2020)  
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### Glacier runoff variations since 1955 in the Maipo River basin, in the semiarid Andes of central Chile

*Ayala Á, Fariás-Barahona D, Huss M, Pellicciotti F, McPhee J & Farinotti D*

**Citation**

APA ▼

Ayala, Á., Fariás-Barahona, D., Huss, M., Pellicciotti, F., McPhee, J., & Farinotti, D. (2020). Glacier runoff variations since 1955 in the Maipo River basin, in the semiarid Andes of central Chile. *Cryosphere*, 14(6), 2005-2027. <https://doi.org/10.5194/tc-14-2005-2020>

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As glaciers adjust their size in response to climate variations, long-term changes in meltwater production can be expected, affecting the local availability of water resources. We investigate glacier runoff in the period 1955–2016 in the Maipo River basin (4843 km<sup>2</sup>, 33.0–34.3° S, 69.8–70.5° W), in the semiarid Andes of Chile. The basin contains more than 800 glaciers, which cover 378 km<sup>2</sup> in total (inventoried in 2000). We model the mass balance and runoff contribution of 26 glaciers with the physically oriented and fully distributed TOPKAPI (Topographic Kinematic Approximation and Integration)-ETH glacio-hydrological model and extrapolate the results to the entire basin. TOPKAPI-ETH is run at a daily time step using several glaciological and meteorological datasets, and its results are evaluated against streamflow records, remotely sensed snow cover, and geodetic mass balances for the periods 1955–2000 and 2000–2013. Results show that in 1955–2016 glacier mass balance had a general decreasing trend as a basin average but also had differences between the main sub-catchments. Glacier volume decreased by one-fifth (from 18.6±4.5 to 14.9±2.9 km<sup>3</sup>). Runoff from the initially glacierized areas was 177±25 mm yr<sup>-1</sup> (16±7 % of the total contributions to the basin), but it shows a decreasing sequence of maxima, which can be linked to the interplay between a decrease in precipitation since the 1980s and the reduction of ice melt. Glaciers in the Maipo River basin will continue retreating because they are not in equilibrium with the current climate. In a hypothetical constant climate scenario, glacier volume would reduce to 81±38 % of the year 2000 volume, and glacier runoff would be 78±30 % of the 1955–2016 average. This would considerably decrease the drought mitigation capacity of the basin.

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<b>Title</b>	Glacier runoff variations since 1955 in the Maipo River basin, in the semiarid Andes of central Chile
<b>Author(s)</b>	Ayala, Álvaro (Mountain Hydrology and Mass Movements) Fariás-Barahona, David Huss, Matthias (Mountain Hydrology and Mass Movements) Pellicciotti, Francesca (Mountain Hydrology and Mass Movements) McPhee, James Farinotti, Daniel (Mountain Hydrology and Mass Movements)
<b>Journal</b>	<i>Cryosphere</i>
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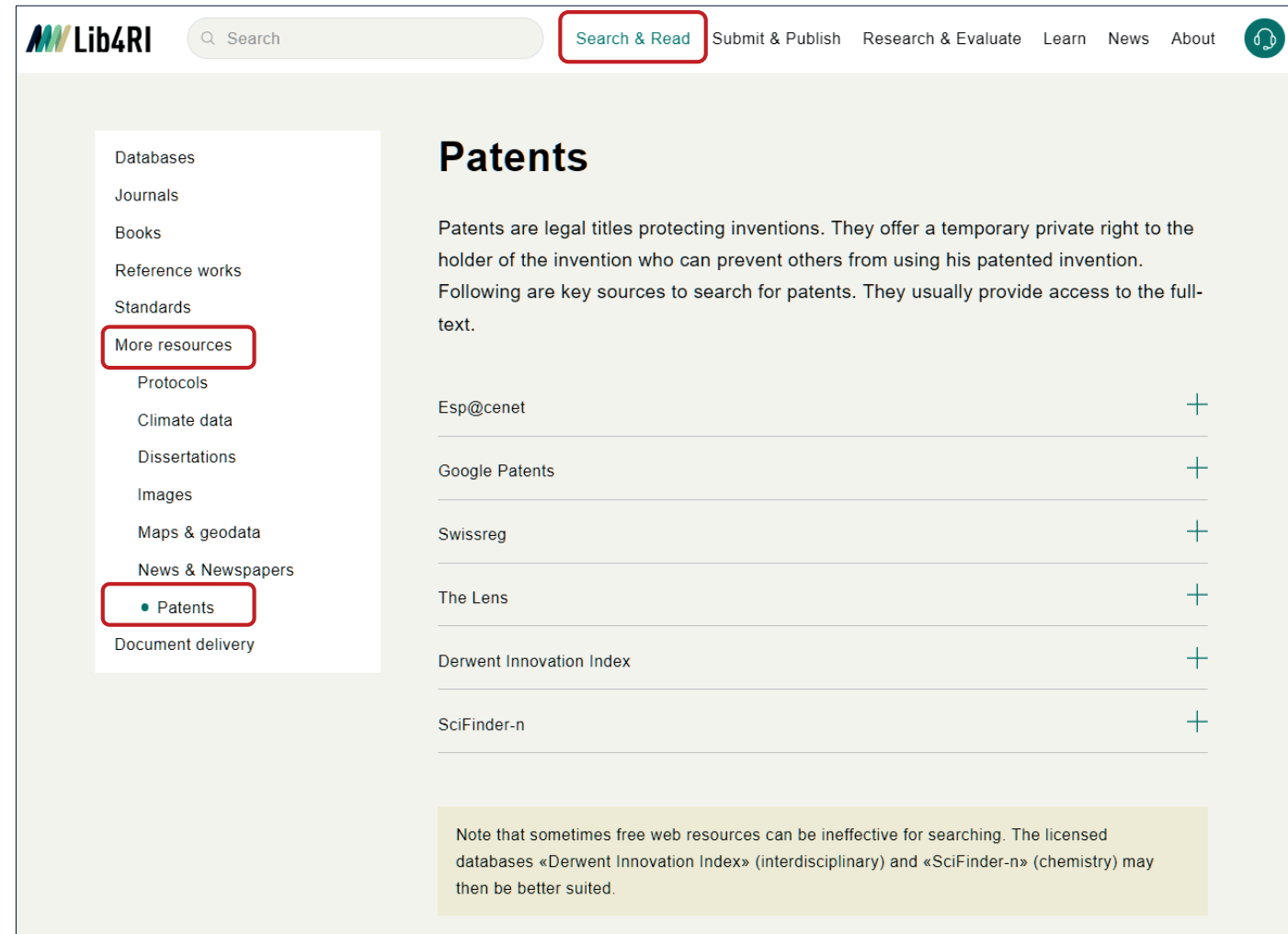
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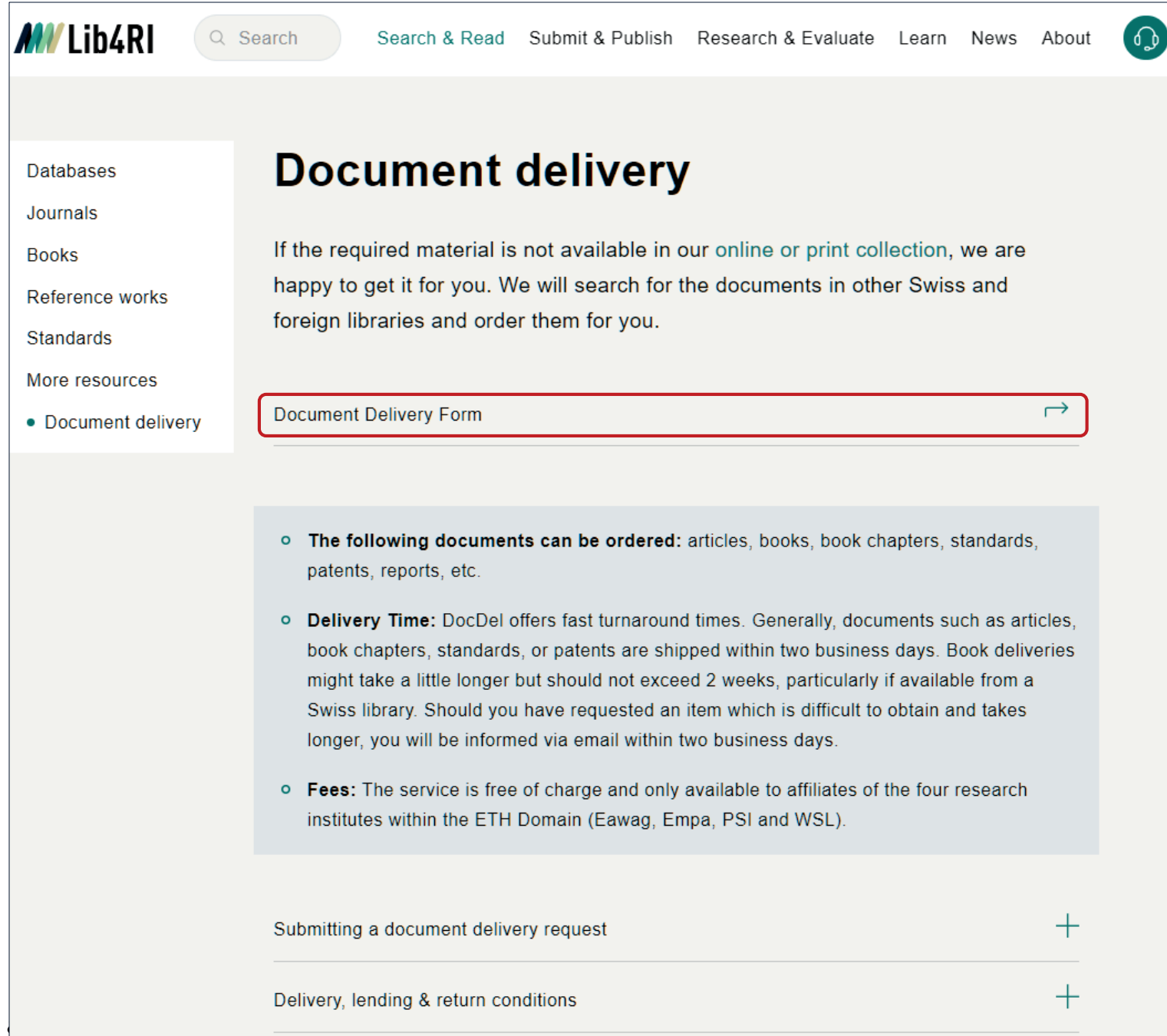
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# AI powered tools

## Literature search – powered by AI

- Yes, there are numerous AI tools (8000, 9000, XXX)
- Tools cannot do everything, take a close look <https://theresanaiforthat.com/>
- ChatGPT ?





## Some tips for effective prompting

- **Clarity and precision:** Clear and precise instructions prevent misunderstandings by the machine.
- **Contextual relevance:** A good prompt takes into account the context of the request.
- **Targeting:** Targeted prompts lead to targeted responses.
- **Linguistic nuance:** The way a prompt is phrased has a significant impact on the response.
- **Feedback loops:** Iterative adjustment of the prompt can help to improve results step by step.





# Literature search – powered by AI

## Features of AI tools

- Summaries
- Extraction of key information
- Suggestions for related publications
- Integration of AI assistants
- Automatic translation

## Tools free of charge

- Semantic Scholar
- Research Rabbit
- Inciteful
- Open Knowledge Maps



## Conclusions ... for the moment

- Results strongly dependent on the scientific discipline and language of the publications
  - Data basis is limited, often not transparent
  - Sources behind paywalls may be missing or not analysed
  - Often only the basic version is free of charge
  - Quality of sources is not necessarily verified and should be checked for accuracy and citation
  - Data protection / privacy / licensing
- **Useful entry point / additional tool !**
- **Try it!**
- **Be critical!**





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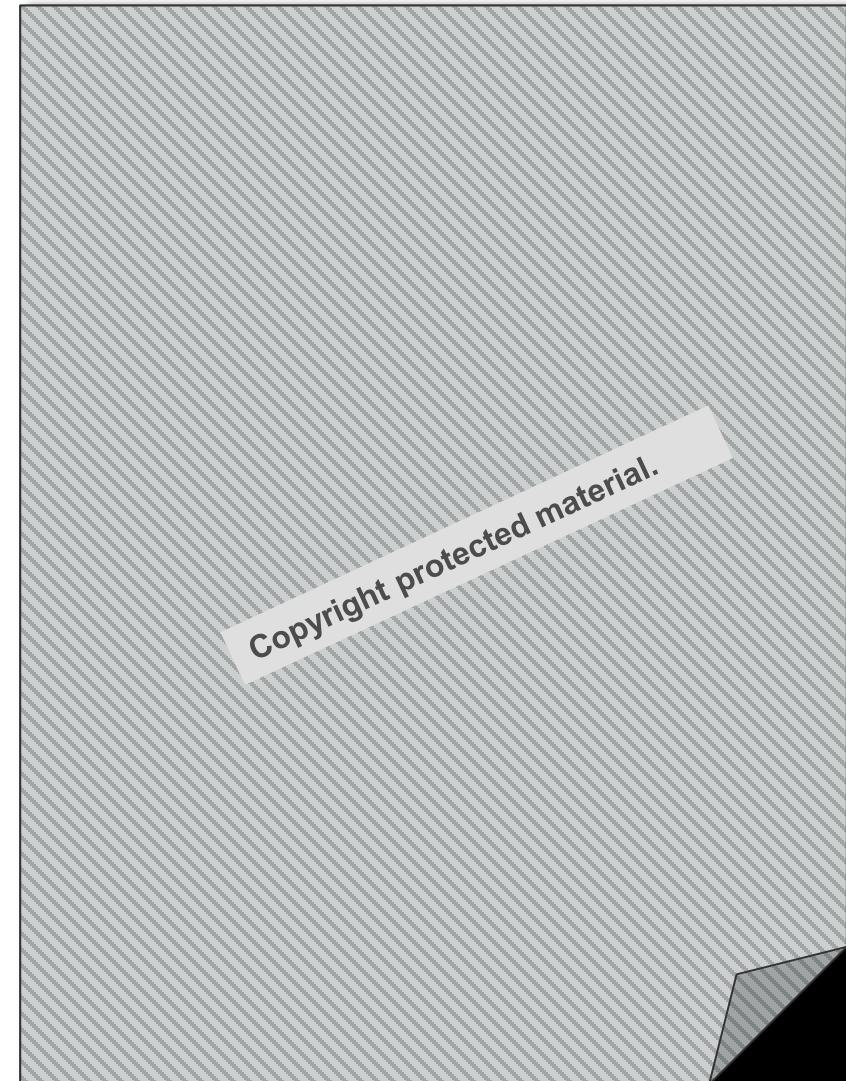
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