

## Reshoring fine chemical and pharmaceutical productions

### Mario PAGLIARO

Istituto per lo Studio dei Materiali Nanostrutturati, CNR, Palermo,  
ITALY

[mario.pagliaro@cnr.it](mailto:mario.pagliaro@cnr.it)



Prolonged shortage of active pharmaceutical ingredients (APIs) in many countries that do not produce critically important APIs requires urgent reshoring of said fine chemical productions. The situation is even worsened by now frequent disruption of the global supply chains, first during the COVID-19 crisis [1] and subsequently with the ongoing Red Sea crisis [2].

Shortage of APIs and formulated drugs, however, continued after the end of the COVID-19 crisis. By late 2023, for example, in response to a shortage of liquid Ibuprofen authorities in the USA were forced to temporarily allow manufacturers to produce and distribute non-approved antipyretic and anti-inflammatory drugs [3].

Many governments in European and North American countries have formally asked companies to repatriate API production. Until the mid-1990s, indeed, western Europe countries, the USA and Japan produced 90% of the world's APIs. In 2017, however, China alone was producing about 40% of the global production of pharmaceutical ingredients [4].

In this lecture, I will first outline the main economic and policy aspects emerging from selected cases of API production reshoring to Europe. Hence, broadening the analysis to include selected cases in China and India, I will address the issue of industrial uptake of continuous manufacturing in fine chemicals production from an economic and industrial viewpoint. I will conclude presenting the three main findings emerging from the present concrete analysis of the concrete situation.

### References

- [1] B. Takawira, R.I.D. Poole, *S. Afr. J. Bus. Manag.* **55** a4048 (2024)
- [2] T. Notteboom, H. Haralambides, K. Cullinane, *Marit. Econ. Logist.* **26** 1 (2024)
- [3] G. Wade, *New Scientist* 27 January **2023**. <https://www.newscientist.com/article/2356728-us-hospitals-are-facing-critically-low-supplies-of-liquid-ibuprofen/>
- [4] A. Nishino, *Nikkei*, 5 April **2022**. <https://asia.nikkei.com/static/vdata/infographics/chinavaccine-3/>

Reshoring fine chemical and pharmaceutical productions

## Mario PAGLIARO

Istituto per lo Studio dei Materiali Nanostrutturati, CNR, Palermo,  
ITALY

[mario.pagliaro@cnr.it](mailto:mario.pagliaro@cnr.it)



## BIO

Mario Pagliaro is Research Director at Italy's Research Council based in Palermo, Italy, where he leads a research Group focusing on nanochemistry, solar energy, green chemistry and the bioeconomy. Developed in co-operation with leading researchers based in more than 20 countries, his Group's research is reported in nearly 360 frequently cited research papers.

During his doctoral work partly carried out in Israel with David Avnir, he jointly developed a catalyst for alcohol selective oxidations that will be later commercialized with the tradename "SiliaCat TEMPO". "IntegroPectin", "NiGraf", "CytoCell@PIL", "GrafeoPlad", "AquaSun", "SiliOrange", "AnchoisOil", "Omeg@Silica", "AnchoisFert", "SiliaSun", "CytoCell", "HyTan", "GreenCaps" and "LimoFish" are some of the new names created by Dr Pagliaro to identify his Laboratory's new functional materials and enabling technologies.

Frequently cited for his excellence in teaching, he has given more than 100 invited public presentations at conferences, seminars, workshops and meetings on the topics of his research and educational activities. In 2008, when a few scholars believed in the forthcoming emergence of photovoltaic technology as a significant contributor to the global energy generation mix, Dr Pagliaro introduced the term "helionomics" in his joint book *Flexible Solar Cells* (Wiley-VCH) which has also been translated in Chinese. Dr Pagliaro ranks in the top 2% World Ranking list of Scientists in all fields of science, 2<sup>nd</sup> amid the world's top 10 bioeconomy scholars, and currently ranks 27<sup>th</sup> within the top 100 Top Italian Scientists in material and nano sciences.