



The role of theoretical research in the development of novel technologies

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Abstract

The authors give examples to prove not only the heuristic and worldview value of theoretical science but also its importance for the development of novel technologies.

References

1. H. Ahmed, "Nanostructure Fabrication," Proc. IEEE 79(8) (1991).
2. A. I. Larkin and Yu. N. Ovchinnikov, "A Nonuniform State of Superconductor," Zh. Eksp. Teor. Fiz. 47 (1964).
3. P. Fulde and R. Ferrell, "Superconductivity in a Strong Spin-Exchange Field," Phys. Rev., Ser. A 135, 550 (1964).
4. Z. Radovic, L. Dobrosavljevic-Grujic, A. I. Buzdin, and J. Clem, "Upper Critical Field of Superconductor-Ferromagnet Multilayers," Phys. Rev., Ser. B 38, 2388 (1988).
5. V. I. Zdravkov, A. S. Sidorenko, G. Obermeier, et al., "Re-Entrant Superconductivity in Nb/Cu_{1-x}Ni_x Bilayers," Phys. Rev. Lett. 97 (2006).
6. F.-Q. Xie, R. Maul, A. Augenstein, et al., Independently Switchable Atomic Quantum Transistors by Reversible Contact Reconstruction, <http://arxiv.org/ftp/arxiv/papers/0904/0904.0904.pdf>.
7. <http://ufn.ru/ru/ufn90/veselago.html>.
8. J. Pendry, "Positively Negative," Nature 423, 22 (2003).
9. V. G. Veselago, "Electrodynamics of Substances with Simultaneously Negative ϵ and μ Values," Usp. Fiz. Nauk 92(3), 520 (1967).
10. Yu. V. Gulyaev, A. N. Lagar'kov, and S. A. Nikitov, "Metamaterials: Basic research and Potential Applications," Vestn. Ross. Akad. Nauk, 78(5) (2008) [Her. Russ. Acad. Sci. 78 (3), 268 (2008)].
11. V. G. Veselago, "Electrodynamics of Materials with Negative Index of Refraction," Usp. Fiz. Nauk 173(7), 790 (2003) [Phys. Usp. 46 (7), 764 (2003)].
12. J. B. Pendry, "Negative Refraction Makes a Perfect Lens," Phys. Rev. Lett. 85, 3966 (2000).



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13. W. Smith, D. C. Padilla, S. C. Vier, et al., “A Composite Medium with Simultaneously Negative Permeability and Permittivity,” *Phys. Rev. Lett.* 84, 4184 (2000).
14. R. A. Shelby, D. R. Smith, and S. Schultz, “Experimental Verification of a Negative Index of Refraction,” *Science* 292(5514), 77 (2001).
15. G. Schmid et al., *Nanotechnology: Assessment and Perspectives* (Springer, Berlin, 2006).
16. H. Paschen, C. Coenen, T. Fleischer, et al., *Nanotechnologie: Forschung, Entwicklung, Anwendung* (Springer, Berlin, 2004).
17. V. V. Luchinin, “Industry of Nanosystems: A Systemic Approach,” in C. Pool, Jr., and F. Owens, *Introduction to Nanotechnologies* (Tekhnosfera, Moscow, 2006) [in Russian].
18. H. Lenk, “Epistemological Remarks Concerning the Concepts ‘Theory’ and ‘Theoretical Analysis’,” in *Universal Design Theory* (Shaker, Aachen, 1995).
19. K. Bogdanov, “Quantum Dots-Handmade Atoms of Nanosizes,” <http://kbogdanov1.narod.ru/nanotechnology/QD.htm>.
20. V. G. Gorokhov, “Specifics of Conceptual-Methodological Analysis of the Formation and Development of Technical Theory,” in *Philosophy, Science, and Civilization* (Editorial URSS, Moscow, 1999), pp. 184–213.
21. V. Gorokhov and H. Lenk, “NanoTechnoScience as a Cluster of the Different Natural and Engineering Theories and Nanoethics,” in *Silicon vs. Carbon: Environmental and Biological Risks of Nanotechnology, Nanobionics, and Hybrid Organic-Silicon Nanodevices* (Springer, Freiburg, 2009), pp. 190–213.
22. A. S. Sidorenko, V. I. Zdravkov, A. A. Prepelitsa, et al., “Oscillations of the Critical Temperature in Superconducting Nb/Ni Bilayers,” *Ann. Phys.* 12(1), 37 (2003).