

Soviet Technology

Description

One of the last American crown jewels of micro-electronics is fast losing its shine.

This is an important point. One of the few technological areas the US had a clear lead over the Soviets in was microelectronics, specifically mass produced microelectronics and thus increased transistor density which leads to the higher clockspeed of computers, signal processing capabilities, avionics, and stuff like adaptive optics (microcomputers are also directly applied in NC machine tools in industry). The Soviets made up for this one area by a much broader spectrum of high technology. The Soviets also could always batch produce small quantities of the very best microelectronics, since their expertise (in physics, chemistry, materials science) was higher. It was just a question of perfecting the mass production of it (the particular kind of precision tooling, clean rooms, quality control practices) to such a degree of uniformity so as to mass produce it cheaply – that was something American industry perfected in the period from WWII to the Apollo program. Also, due to economic problems Soviets did not build enough production plants for microelectronics, so there was a production bottleneck on top of it. But the “technology” was in fact developed (just that actual components were in short supply).

Basically, since the Bell Labs system was destroyed in the 70s/80s, the US has “invented” nothing comparable. No interesting mechanisms (like the advances in WWII electro-mechanical fire control systems, servomechanisms and automatic control), no fundamentally new devices, no really new materials, etc. The US decided to just completely exploit an existing area (microelectronics – in one of those rare situations in which tiny advances in one narrow area automatically lead to “revolutionary” capabilities elsewhere (towards lower weight and power consumption) just because they are all related to a common device, the transistor) until now when semiconductors have reached a physical dead end, and on the other hand import Japanese machine tools for producing its own military equipment (e.g., atomic submarines). Soviets were ahead in: the automatic docking of spacecraft, virtually all parts of robotics and electro-mechanical (as opposed to purely solid state electronic) systems, hybrid computers instead of purely digital computers, photodetectors (lead-salt detectors used in military andIRST systems) used in homing devices, portable power plants (like the Pamir-3U device). Fundamentally new device schemes and even whole parts of fundamental science close to technology – nonlinear optics, “chaos in dynamical systems”, sustained thermonuclear fusion (the tokamak fusion trap), and ion (Hall effect) electrostatic thrusters (that are still the key to deep space propulsion), the “synchrotron” method of particle acceleration, were invented by Soviets.

That is to say: the US altered the nature of its technology base around the 1970s. Instead of expanding on a very broad front as in WWII, it relied on a single technology (that of microelectronics) with the belief that this is the most important part of the “technology base”. This is true in some ways: it is the most important base for increasing the economic effectiveness of ordinary (not high-performance) products, and so the most important base for boosting the economy as a whole. It improves the vast majority of the products that circulate in the economy. Production processes get far quicker and more efficient, energy consumption is reduced, etc. It is also crucial for discovering oil prospects (which

depends heavily on microelectronics and general information processing) — this is why Russia still inherits this dependence on Exxon (but also why it has no good reasons for continuing to do so).

Thus if the US loses its predominance in microelectronics, it has nothing left.