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# SCIENCE First Hand

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Russia has developed the world's first specialized accelerator facility for boron neutron capture therapy of the most aggressive cancerous tumors

Several young craters and crater fields point to a cosmic origin of global climate catastrophes over the past twelve millennia

Specific substances in the saliva of blood-sucking ixodid ticks may provide a blueprint for new medical products, including surgical glue and anticoagulants

Blood-sucking ticks can carry and transmit rickettsia bacteria, which cause tick-borne fever and are "relatives" of typhus pathogens

Soviet scientists discovered carbon nanotubes forty years before the sensational Nature article that created a boom in research on the "material of the future"

A Journal
for Inquisitive People



*Founder and First Editor-in-Chief (from 2003 to 2020) of the journal SCIENCE First Hand Academician Nikolay L. Dobretsov*

*"The natural desire of good men is knowledge"*
Leonardo da Vinci

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*Dear friends!*

*Since the pandemic broke out, we have all become much more concerned with our microscopic neighbors, which can threaten our health and even our lives. In the new journal issue, scientists from the Novosibirsk Institute of Chemical Biology and Fundamental Medicine tell the reader about tick-borne rickettsioses, which are acute infectious diseases transmitted by blood-sucking ixodid ticks. Although not as notorious as tick-borne encephalitis, these diseases also spread widely across the globe, ranging from Rocky Mountain spotted fever (RMSF) of North America to Siberian tick-borne rickettsiosis, which occurs in the Asian part of Russia and in the neighboring countries. In addition to the well-studie d typical rickettsiosis, different countries have recently reported cases attributed to pathogens previously considered nonpathogenic, and the disease can take a severe, atypical course.*

*Parasitic ticks and mites, including ixodid ticks, which carry and transmit rickettsia and other infectious pathogens, have indeed earned their macabre reputation. However, few people know that they form only a small part of the thousands of tick and mite species, most of which perform essential functions in natural ecosystems and some even bring direct benefits to humans – they help make cheese or control agricultural pests in greenhouses and in open fields. Moreover, parasitic ticks, endowed with an arsenal of specialized biomolecules that help them attach to victims, anesthetize the bite site, and block the body's defense reactions, can serve for biotechnological purposes. These compounds are used to develop such medical products as surgical glue, anticoagulants, immunosuppressive drugs, etc.*

*The article by Dr. Sergei Taskaev (Budker Institute of Nuclear Physics, BINP) discusses boron neutron capture therapy (BNCT) for cancer, capable of treating aggressive cancerous tumors such as brain glioblastoma. The core idea of this radiation technique is to irradiate cancer cells saturated with a stable boron isotope with a stream of thermal neurons, which leads to its nuclear decay. This technology had long remained an experimental one, until in 2008 BINP physicists first launched a unique accelerator facility for BNCT with a lithium neutron generating target. Since 2019, BINP specialists, together with the US company TAE Life Sciences, have been working on the first prototype of a medical facility for the Chinese company Neuboron Medtech, which was shipped to the customer in the summer of 2021.*

*Another journal article reveals little-known facts from the history of scientific discoveries about carbon nanotubes. The boom in this field began in the early 1990s after the Japanese scientist Sumio Iijima published in Nature an article about his discovery of very thin cylindrical formations in carbon. However, Soviet scientists L. V. Radushkevich and V. M. Lukyanovich made a similar discovery almost forty years earlier. Judging by Radushkevich's memoirs, preserved by his granddaughter in her archives, the study of carbon nanotubes remained on the sidelines of the scientists' main interests, and their work, published in Russian in 1952 in a Soviet journal, went unnoticed by the world scientific community.*

*This issue also presents an article by Dr. Viacheslav Gusiakov, who studies tsunamis and natural disasters. Judging by recent events in Europe, the greatest threat to humanity comes from the "internal enemy" rather than external ones, including epidemics of new diseases. However, one must not underestimate the threat to civilization and biosphere coming from space. The author provides evidence of a series of global cataclysms, including those that occurred after the last glaciation, which had had a huge impact on climate and on the living conditions of man and had likely been caused by comet and asteroid impacts. People will be powerless should such an event happen as we now have no effective system for protecting the Earth from space threats and unlikely will in the near future, so we can only plan measures to mitigate the consequences.*

*Editorial board and editorial office of the journal SCIENCE First Hand*