

THE RETURN OF THE BIG SCIENCE TO ARMENIA

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(Translated from Russian)



In August, 2002, the Scientific Panel established by the U.S. State Department gave a favorable review to the CANDLE, 3rd generation synchrotron facility, Design Report developed by Armenian scientists.

“The facility described in the proposal is a world class facility capable of enabling frontier work across the full range of physical, life and engineering sciences. Being among a few of the most modern synchrotron facilities, its users will be able to compete at the frontier...”

“The Conceptual Design Report is a very comprehensive document. The level of completeness is comparable to that of the NSLS and ALS Conceptual Design Reports. The panel is deeply impressed with the technical quality of the proposed accelerator systems, the efficiency with which the proposal was produced and the positive attitude and commitment of the performers ...” (from Panel Report).

The prestigious American magazine “ Science” in its paper “Armenian Gears up for synchrotron” called the projected facility as a manna for the regional science. The new facility in Armenia is considered in the paper as an important achievement for the science in world in large.

“CANDLE is an outstanding scientific and technological opportunity not only for its region but also for the entire research community in Europe and in the world. I am sure that CANDLE, after commissioning, will be used by researchers coming from all over the world. I for one would seriously consider this possibility.” (Georgio Margaritondo, Coordinator, European Round table for Synchrotron radiation and FELs)

This great event passed being not recognized in Armenia.

Mr. Tsakanov, two years have passed since your previous interview to “GOLOS ARMENII” highlighting the Project SESAME. Now you are Technical Director of Project CANDLE. Are we looking at a new name or is it an altogether new project?

CANDLE is a fundamentally novel project which is incomparable with Project SESAME and exceeding the latter by several orders of magnitude with regard to the photon beams characteristics. CANDLE is on a par with projects like SOLEIL (France), DIAMOND (Great Britain), and SPEAR3 (US). Those machines are the ones that will enable frontier work across the structural biology, chemistry, nanotechnology, medicine and materials science, as well as microstructural design.

What is the Project’s current stage of development?

An outstanding high-energy physicist, Alexander Abashian from Virginia Tech., USA, is appointed as CANDLE director. The Board of Trustees is established under the leadership of a well-known businessman from New Jersey Jirair Hovnanian.

The scientific-engineering design report of the Project is completed. Since the bulk funding for the compound construction is to be done by the US State Department, a special panel for the Project was established in July 2002 headed by Maory Tigner, a top-level accelerator physicist from Cornell University. Forming the panel are the heavyweights of science like Hermann Winick from Stanford, David Moncton from Argonne National Laboratory, etc. Included in the panel were experts from the World Bank and economic advisors from the George Washington Center. On August 14 – 15, a special session of the Review Panel was held for a thorough discussion with CANDLE top management. Assessment and evaluation by the panel was in excess of our most headlong expectations. The project was validated as conforming to the world class standards. I regard it as a great tribute to the Armenian science.

What is going to be the specific outcome for this country resulting from the project, will it produce an impact upon the scientific status of Armenia, if implemented?

Significance of this type of center in Armenia for scientists of leading world institutions on medicine, biology, chemistry, materials science, physics is beyond any doubt. Thus, the research program of a similar accelerator in Stanford, USA (SPEAR2) involves over 2000 scientists from 20 plus countries, representing more than 250 institutions and private entities. In beamline characteristics Project CANDLE will overstep the SPEAR2 machine in excess of 100 times (!). Try to imagine the future awaiting CANDLE, given that even the SPEAR2-type machines are unavailable either in Eastern Europe or in the FSU, or throughout the enormous continent of Asia, with the only exception of Japan. An establishment of the compound of this scale will push Armenia to the cutting-edge positions spanning the gamut of all applied research. That would naturally result in an enhanced role of Armenia as the center of science-and-engineering integration for the FSU, Eastern Europe and Asia. In actual fact, the limits of collaboration and teamwork

extend far beyond the regional bounds, so that CANDLE is visualized as an integral part of the worldwide research effort. Many prominent scientists and managers of major US, European, Russian and Japanese projects have corroborated their expectancy of our cooperation, regarding the CANDLE construction in Armenia as an important feature of developing science.

The number of similar machines around the world is extremely limited. Meanwhile, the use of synchrotron radiation research is growing exponentially. The current number of users worldwide is far in excess of the available capacities. By the time the machine becomes fully operational, part of the world research will move to CANDLE.

However, an electron synchrotron exists in Armenia. So, what is the role of a new accelerator facility?

Those things are professionally incomparable. Formerly, the Yerevan synchrotron built in the 60s used to be rated among the largest in the world, its construction in Armenia having been an event of global significance. Its clout upon Armenia's strategic development generating education, science and culture in an extended sense cannot be overestimated. It is rather for the senior generation of the Armenian scientists to determine the historical meaning of this occurrence. The Yerevan synchrotron staged a number of spectacular research assignments on nuclear physics, transient radiation and experimentation procedures. However, as early as 1972, six years following the accelerator initiation, Artem Alikhanian and his team put forward a new project of the electron-positron collider. The idea of a new accelerator in Armenia had been long hovering around. Within our target area of the photon energies, the CANDLE photon beams brightness will exceed the rating of the existing accelerator by a thousand billion times (10 with twelve zeros). We are going to own a machine one thousand billion times better, with only half of the electron beam energy. It goes without saying that the new facility will be fully automated leaning upon the state-of-the-art accelerator physics and technology.

What is the prospective lifetime of CANDLE, before it becomes obsolescent?

There is a great difference between the accelerators for fundamental and applied research. The accelerator facilities for fundamental research are mainly established for a very specific target in the microworld, or, speaking imaginatively, for locating a specific new particle or phenomenon as predicted by the theory. Having implemented an expressly indicated project, the operational accelerator has become irrelevant, necessitating radically new approaches. As to the applications-directed accelerators like CANDLE, their experimental programming can be zeroed in on the entire domains of natural science. According to experts, the up-to-the-time relevance of CANDLE in structural biology, materials science, chemistry, medicine, etc., will remain visible for 50 years at least.

It is to be noted that inherent in the project is the potential for its further development like upgrading to 100 experimental stations or producing the free electron laser. Another in-built capacity is upgrading the beamline characteristics by another order of magnitude. All that without reviewing the machine basics. The compound will march in step with time.

What are the Center's current objectives?

To be established shortly are expert panels with involvement of the leading foreign scientists like Helmut Wiedemann, Joerg Rossbach, Ernest Weireter, Andrey Lebedev, Gennadi Kulipanov, et al. A concurrent development will run a program of research and research team formation both inside and outside Armenia, presented as groups and individual scientists to do research in physics, chemistry, biology, medicine, nanotechnology, geology, archaeology, and ecology.

The envisaged range of operations is enormous. It will include basic research in high-temperature superconductivity, decoding the compound DNA structures, protein crystallography, development of new drugs and materials, perfumes, microelectronics, antiques dating and recovering the lost technologies, etc. The headquarters of all those research efforts will naturally reside in the relevant scientific establishments. Our objective is to provide the scientists with a state-of-the-art instrument capable to inquire into the microworld and to develop new technologies. A structurally integrated cluster of satellite institutions is being envisaged for biology, nanotechnology, materials science and medicine.

We intend moreover, to convene a marketing of industrial and research capacities for Armenia's science and industries to manufacture components for the accelerator and experimental channels. It is our objective to make a full use of the available potential without compromising the high-quality performance. It is for me a matter of certainty that the Armenian industrial capacities are fully sufficient to produce the vacuum chamber and magnetic system of the accelerator to meet the most stringent requirements. Success of the forthcoming center is directly contingent upon the Armenian industry's capabilities to cope with similar objectives.

Another scope of activities is training the graduate students both in domestic and leading western educational centers. We shall require state support in providing special quotas for gifted and talented graduates to be further trained post-gradually or using the probation and fellowship contingencies at foreign scientific establishments.

Is there any rationale behind running the new center as a non-governmental non-profit organization?

It is a standard situation. It can by no means belittle the role of the government or public administration in matters of initiating and running the new center. It is contrariwise indicative of the administrative maturity in selecting the right ways of strategic develop-

ment. The accelerator centers worldwide aimed at applied research have their inherent features of development and operation, which are not always coincidental with their respective systems of government administration. What is needed is a lot of flexibility and operational efficiency in decision making overstepping by far the borderlines of standard system operation.

It is not by chance that similar centers being designed elsewhere, are all non-governmental entities, like project SOLEIL in France, DIAMOND in England, ANKA in Germany. A spectacular example is the interaction between the government and SPRING 8, the national center of synchrotron radiation of Japan, the one very similar to CANDLE. Originally the Center had been established as a non-governmental organization. By virtue of its crucial importance for the country's strategic development, SPRING 8 was subsequently awarded the status of the National Center of Synchrotron Radiation.

Your plans seem to be extremely ambitious. Are you positive they will be implemented?

We have trodden a long and dramatic path. We have succeeded in overcoming many conflicting interests, oftentimes unrelated to the project. We have overcome a serious trial to eventually obtain authorization for our scientific case to build the new center. The country's domestic response to the project has undergone a radical change. That is definitely not accidental. The Big Science is on its way to Armenia, and it cannot be stopped. I am grateful to all scientists and experts, working groups and Institutes, state officials and the country leadership for the support rendered to this project. Our joint effort is capable of creating a scientific center that would be rated among the best in the world. That would be a game with no losers, and our countryland will secure a better life for the succeeding generations.

It is a matter of great satisfaction to me that this project is to be implemented in Armenia; our team includes highly skilled professionals that would be a boon for any scientific center of the world. It is joyful to see the country taking the turn to a civilized development. To my colleagues and me that inspires confidence in the future. We have set a monumental task and are fully determined to put it into life.