CRD FRIENDS NEWSLETTER

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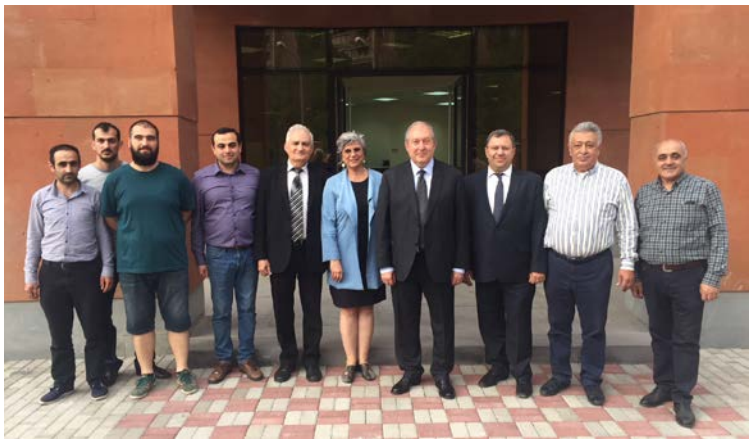
NEW ARMENIAN PRESIDENT VISITS YERPHI AND CRD



President Sarkissian 4th from right, Prof. Ani Aprahamian to his right, Mr. Nerses Yeritsyan to his left, with YerPhI and CRD Scientists

On May 3 Armenia's President Armen Sarkissian, accompanied by the chairman of YerPhI's board of trustees, Mr. Nerses Yeritsyan, visited Yerevan Physics Institute (YerPhI) headquarters in Yerevan. The president, who himself has a PhD in Physics, met YerPhI's new director together with both senior and young scientists to discuss their research.

In April 2018 the Board of Trustees of the Alikhanyan National Scientific Laboratory, YerPhI, approved the appointment of Ani Aprahamian, professor of Physics at Notre Dame University (Indiana, USA), as YerPhI's new director. Prof. Aprahamian takes over YerPhI's leadership from Prof. Ashot Chilingarian who held this position for 10 years while simultaneously continuing his role as the head of its Cosmic Ray Division (CRD). Prof. Chilingarian will continue to focus his attention on directing CRD's research and education projects.

During the president's visit, Prof. Ashot Chilingarian introduced him to CRD's ongoing research projects including the Space Environmental Viewing and Analysis Network (*SEVAN*), the Armenian Geophysical Network (*AGN*), and CRD's Light Detection and Ranging (*LIDAR)* facility.

The *SEVAN* network was designed and deployed by young CRD scientists and engineers to monitor cosmic radiation in the atmosphere. Networked cosmic ray detectors are installed in a number of Eastern European countries as well as in Armenia and Artsakh. Data from the detectors is relayed via the Internet to CRD's headquarters where it is analyzed and made available to scientists worldwide. The *LIDAR* facility was designed and fabricated in Armenia for atmospheric research.

Prof. Chilingarian informed the president about CRD's annual international summer school, held this year from June 4-8 at its Nor Ambert center on Mt. Aragats, and CRD's upcoming international conference *Thunderstorms and Elementary Particle Acceleration* (TEPA), held at its Nor Ambert center from September 17-20. Details are at https://www.atmospheric-electricity-net.eu/node/106 .

The Support Committee for Armenia's Cosmic Ray Division congratulates President Armen Sarkissian. We thank him for his genuine interest in the Armenian Science, in YerPhI and especially in CRD. We welcome Prof. Ani Aprahamian to her new role as YerPhI's director and thank Prof. Chilingarian for his service as director and continuing service as the head of CRD. Our commitment to Armenian science, and particularly to CRD's many successful endeavors, continues.

GYUMRI NODE OF ARMENIAN GEOPHYSICAL NETWORK

Figure 1. Armenian Geophysics Network (AGN)

CRD's *Armenian Geophysical Monitoring and Forecasting Network (AGN)* was launched in 2016. Its main goal is to expand and upgrade an integrated network of particle detectors, electric field monitors and lightning detectors in strategic locations in Armenia and abroad. It will further the establishment of space weather and thunderstorm forecasting services aimed at early recognition of various anomalous phenomena in the earth's atmosphere and in near-earth space.

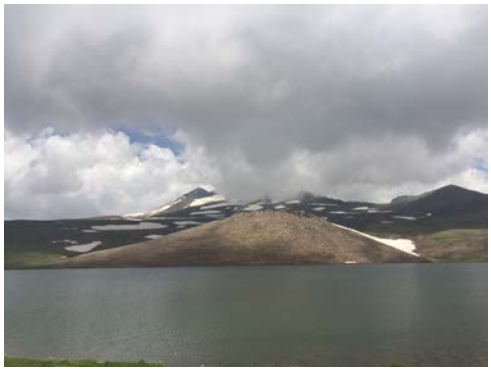
Currently the AGN includes 6 sites covering the most important parts of Armenia: Mt. Aragats at two alititudes, Lake Sevan, Armenia's capital Yerevan, Dilijan International School in the north, and Shushi University in Artsakh (see Fig. 1).

CRD is establishing a 7-th node at Gyumri's Institute of Geophysics, Engineering and Seismology. The project is partially sponsored by the Armenian Engineers and Scientists of America - Michigan Chapter with generous Diaspora contributions.

The AGN provides opportunities for scientists and students alike to operate and maintain AGN's scientific infrastructure and conduct research that is of vital importance to Armenia and the world at large. The precise synchronization of the multiple measurements, on-line data analysis, and correlation studies will be conducted using the ADEI (Advanced Data Environment Infrastructure) applications developed at CRD. Based on the data analysis, fundamental and applied physics concepts will be formulated as ongoing research and PhD theses. Example of such projects include: correlation of seasonal variations of temperature and atmospheric pressure in Armenia with the frequency of thunderstorms and lightning flashes, and analysis of particle fluxes due to solar activity and other causes.

This is another new and emerging science pioneered by the CRD, as was CRD's pioneering research on particle acceleration in thunderstorms.

MASSIVE PARTICLE SHOWERS FROM THUNDERCLOUD ON MT. ARAGATS.



Thunderclouds on Aragats open a window for pioneering research for CRD

On May 8-9, 2018, at its high altitude research station near the south peak of Mt. Aragats at10,500 ft. elevation, CRD's AGN observed massive radiation showers of gamma rays and electrons. Each burst lasted from one one-thousandth of a second to a few minutes with new bursts occurring for many hours. The gamma rays reached energies of up to 50 million electron-Volts. This radiation was generated in charged layers within thunderclouds.

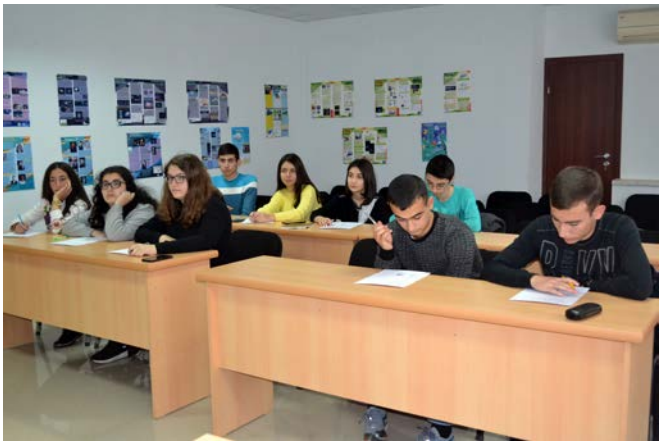
The CRD has been studying the phenomena of Thunderstorm Ground Enhancements (TGEs), a process in which radiation, mimicking cosmic rays, are generated within thundercloud layers. Though at Mt. Aragats thunderstorms are frequent and severe, the energy and duration of the May 8-9 radiation bursts surprised even CRD's physicists who have been conducting research in this field for nearly 10 years. Each radiation burst terminated when lightning flashes occurred, then new bursts of radiation would begin. CRD scientist, Dr. Bagrad Mailyan, published a seminal paper describing the spectrum of similar radiation bursts in 2011.

Extensive data on the radiation, meteorological parameters, electric and magnetic field measurements, etc has been logged for the May, 2018 event.

A number of research reports have been published in prestigious international physics journals based on the recent observations, allowing scientists to gain a new understanding of this enigmatic phenomenon. More research and reports are on the way.

This research could require new aircraft safety procedures to avoid harmful radiation from thunderclouds. Also, since this radiation can generate carbon-14 isotopes in the atmosphere, it could provide new calibration procedures for carbon dating of archaeological samples, which relies on a presumed known level of carbon-14 in the earth's atmosphere. Other practical applications benefitting humankind will surely result.

2018 INTERNATIONAL SPACE EDUCATION SUMMER SCHOOL AT CRD



Focusing on the homework assignment students looking for some hints from the lecturers.

CRD conducted its annual Summer School from June 4 - 8 at its Nor Ambert research station

Focus was on four areas of physics: "*Cosmic Ray Particles in the Atmosphere"*, by Professor Ashot Chilingarian; "*Astroparticle Physics"* by Prof. Johannes Knapp, from DESY (German particle accelerator center); "*Experiments in Modern Particle Colliders"*, by Dr. Norik Akopov, from YerPhI; and "*Fundamental Constants of Physics"*, by Dr. Thomas Naumann from DESY.

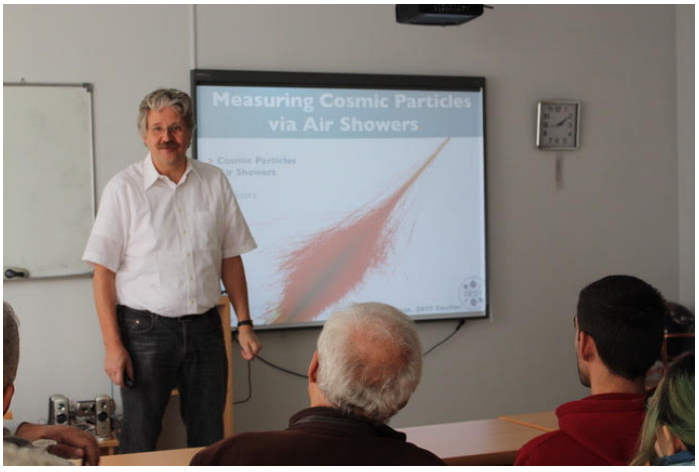
Classes included exercises in theoretical and experimental methods with discussions about how simulations can accurately explore physical phenomena that are not readily amenable to laboratory experimentation.

Students from Dilijan and Artsakh, where CRD has AGN installations, as well as students from Yerevan and abroad participated in the International Summer School.

CRD's programs target students considering a career in science or engineering. A special session explored current and future joint research efforts between Germany and Armenia.

As part of the summer school program, students and staff visited historical/cultural sites in Armenia, enhancing their well-rounded outlook for their future.

PROF. JOHANNES KNAPP ON CRD



Prof. Johannes Knapp from DESY, delivering a seminar for CRD staff and students at CRD's Yerevan headquarters.

Prof. Johannes Knapp is a highly respected astrophysicist and professor emeritus from Leeds University in England. He is currently working at the German particle accelerator center, DESY. He is a long-time collaborator with CRD with experiments of his own on Mt. Aragats. Here is what he has to say about the CRD:

"*I firmly believe that the Cosmic Ray Division at the Yerevan Physics Institute pursues very interesting and timely questions in the field of cosmic ray and solar physics research, enjoys an international reputation for both its experimental work and its know how on novel analysis techniques.*

CRD is internationally competitive (given the appropriate financial support) and makes best use of the available infrastructure and personnel. It builds on the invaluable experience of the people working there, and last but not least provides an excellent platform for students' education in theoretical and experimental physics as well as modern analysis techniques.

I strongly support the continued and increased financial support of the scientific projects of this group. I also suggest providing funds for the maintenance of the Mt. Aragats infrastructure which once gone, will be nearly impossible to rebuild."

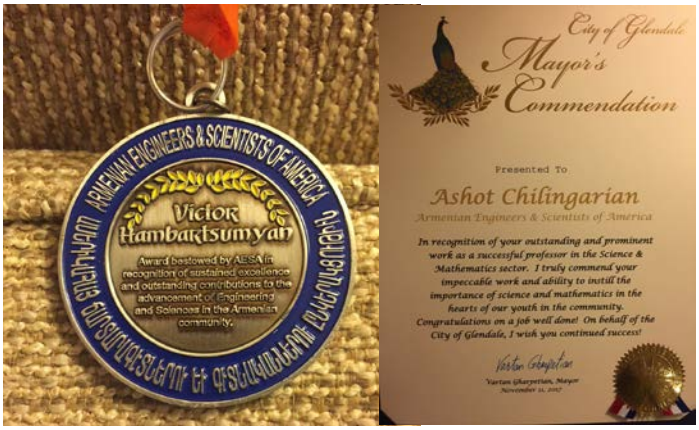
☐ Yes, I want to promote Armenian science and education by supporting the excellent work of the dedicated scientists, engineers, technicians, & students of the Cosmic Ray Division of Artem Alikhanyan National Laboratory (also known as the Yerevan Physics Institute).

Name _____ Address _____

My contribution is in the amount of ☐ $5000 ☐ $2000 ☐ $1000 ☐ $500 ☐ $200 ☐ $_____

Please send this cut-out with your check, payable to **AESA-CRD**
and mail to the Support Committee of Armenia's Cosmic Ray division at:
AESA-CRD, P.O. Box 655, Menlo Park, CA 94026

PROF. CHILINGARIAN RECEIVES PRESTIGEOUS HAMBARTSUMYAN AWARD



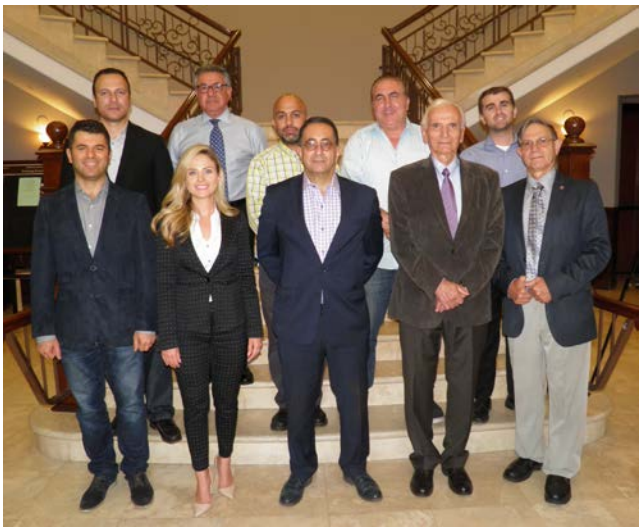
AESA's Victor Hambartsoumyan medal awarded to Prof. Ashot Chilingarian in November, 2017

In recognition of his sustained excellence and outstanding contribution to the advancement of engineering and science in Armenia and abroad, the Armenian Engineers and Scientists of America (AESA) awarded the prestigious Victor Hambartsumyan award to Prof. Ashot Chilingarian at their annual award banquet in November 2017.

On behalf of the City of Glendale, Mayor Vartan Gharabetian, in his turn, honored Prof. Chilingarian with a plaque emphasizing Prof. Chilingarian's outstanding and prominent role as a successful professor in the Science and Mathematics sector. The mayor especially noted Prof. Chilingarian's ability to instill the importance of science and mathematics in the hearts and minds of the youth.

Prof. Chilingarian thanked the AESA members and the Diaspora supporters in attendance for their continued partnership, and affirmed that scientific excellence on a global scale and development of young scientists in Armenia as well as in the Diaspora is the mission of the CRD. He invited supporters to visit the research centers on Mt. Aragats and in Yerevan and encouraged the young people to participate in the annual Space Science Summer schools at CRD's Nor Ambert conference center on Mt. Aragats.

Armenian Scientists and Engineers of America: Long-Time CRD Partners



2018 AESA Board Members. Left to right, front row: Richard Ohanian, Lucine Malakian, John E. Shirajian, Dr. Ara Chutjian, Alex Natanian; back row: Zirair Tourgoutian, Vasken Yardemian, Arin Abed, Aram Ter-Martirosyan, Asadour Tarakchian

The Armenian Engineers and Scientists of America, (AESA) is a non-partisan and non-sectarian philanthropic organization focused on addressing professional, technical and scientific endeavors of Armenians worldwide.

AESA graciously partnered with the Support Committee for Armenia's Cosmic Ray Division (SCACRD) during SCACRD's founding days in 2000. The partnership between AESA, SCACRD, and CRD is a shining example of how the Diaspora and Armenia can work together for the greater good of the Armenian community worldwide.

Through the support facilitated by AESA, CRD has not only achieved scientific excellence but has also provided opportunities for Diaspora upper level college students to spend summers as interns at CRD's world class and unique research centers.

CRD and SCACRD are grateful to AESA and look forward to continued fruitful partnership.

Visit **www.crdfriends.org** for more information about the CRD and www.AESA.org for more information about AESA.

The Support Committee for Armenia's Cosmic Ray Division (SCACRD) operates under the umbrella of the Armenian Engineers and Scientists of America Inc. (AESA), a 501 (c) 3, tax-exempt (ID 95-3957498), charitable organization dedicated to promoting scientific and engineering excellence in the United States and Armenia. AESA has chapters in California, Michigan, New York/New Jersey, and the greater Metropolitan Washington DC area (www.aesa.org).

In Armenia, SCACRD operates under the umbrella of the Yerevan Physics Institute (YerPhI) named after Artem Alikhanian, a non-profit, non-governmental, independent organization dedicated to the promotion and funding of science and education for peace in Armenia (www.yerphi.am).

AESA's and YerPhI's financial integrity are assured by annual audits in accordance with international standards by both the US Internal Revenue Service and the independent company Grant Thornton International respectively.