

CRD FRIENDS

NEWSLETTER



Volume 13, Number 1

www.crdfriends.org

NOVEMBER 2019

THREE CRD STUDENTS TO ATTEND AMERICAN GEOLOGICAL UNION CONGRESS IN SAN FRANCISCO: HRIPSIME MKRTCHYAN TO DELIVER AN INVITED TALK



CRD's representatives to the AGU Congress in San Francisco with their advisor.
Left to right: Hripsime Mkrтчyаn, Davit Aslаnyаn, Prof. Ashot Chilingarian, Gayane Karapetyan.

Traditionally, the scientists of the Cosmic Ray Division (CRD) of the Yerevan Physics Institute (YerPhI) are well represented at the annual American Geological Union (AGU) Congress at San Francisco's Mascone Center. Annually some 20,000 scientists from around the world gather in San Francisco for a week to report on various topics such as seismology, climatology, global warming, space weather and recently on thunderstorm enhanced particle acceleration in the atmosphere. The importance of the latter two areas of research were initiated by the CRD and quickly adopted as key areas of new research around the world.

In 2019, the AGU congress will be held from December 9 through 13 with three bright young scientists from CRD representing Armenia, presenting seven key works on the ground-breaking subject of particle acceleration in the atmosphere as a result of thunderstorms.

Just as for space weather research, the CRD research stations on Mt. Aragats are ideal locations for thunderstorm research as well, given the frequent occurrences of many types of thunderstorms each year on Mt. Aragats. Many of the methods and instruments developed for cosmic ray research at the CRD are also applicable to thunderstorms.

Hripsime Mkrтчyаn, who received her PhD degree in 2019 will deliver an invited oral presentation titled "*When You Wish Upon a Star: Perspectives on the Future of Beyond Earth Sciences*". Davit Aslаnyаn and Gayane Karapetyan, students at the CRD, will present poster papers on their research.

Hripsime is also a panelist on a forum about the electric field asymmetry characteristics of thunderstorms.

The Support Committee for Armenia's Cosmic Ray Division, Prof. Chilingarian, the CRD staff and students are grateful to our friends in the Diaspora who empower the successes of our young scientists.

TWO NEW SEVAN NODES AT DESY IN HAMBURG, GERMANY



SEVAN detector at German National Laboratory DESY. Left to right: Balabek Sargsyan, Tigran Karapetyan, Michael Walters, Johannes Knapp, Ashot Chilingarian.

CRD's *Space Environmental Viewing and Analysis Network (SEVAN)* was launched in 2007 as part of United Nations Basic Space Science Initiative, International Heliophysics Year 2007, and was the most successful

The SEVAN network consists of autonomous instruments to measure cosmic and solar radiation, designed and built by the scientists in Armenia and deployed worldwide to monitor Space Weather phenomena.

While one SEVAN instrument allows substantial monitoring of space weather events, SEVAN's modular design allows integration of updated instruments as requirements evolve and technology advances.

Global data gathered from SEVAN installations is shared among the partners via the Internet. Analysis methods developed by the CRD and the partner nations are used to help understand the effects of solar events, which can cause serious harm to infrastructure on earth and in space..

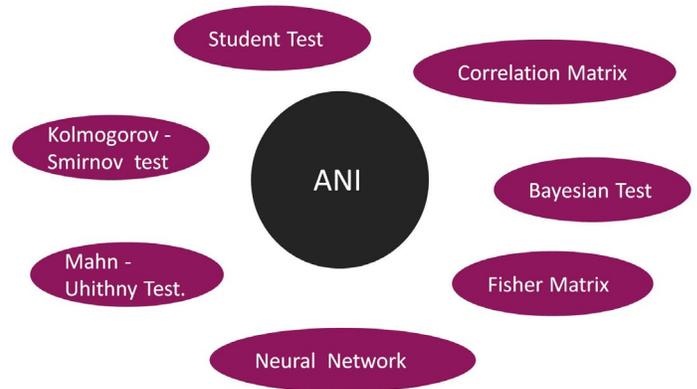
In October 2019 two SEVAN nodes were installed at DESY in Germany, one of the world's leading research laboratories and a long time CRD partner. DESY directorate is extremely pleased and pledged continued cooperation with the CRD.

As Prof. Chilingarian puts it, "the entire globe is a cosmic ray detector," meaning that for a full understanding of the universe around us, and in particular our star the sun, we must study it from vantage points across the globe.

The nations in the SEVAN collaboration include Armenia, Croatia, Bulgaria, Germany, India, Israel, and China.

Each participating country is responsible for securing funds for hosting the SEVAN network, as well as for sharing data on the collaboration's database.

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE AT CRD



CRD's ANI Statistical data analysis code was recently streamlined towards Machine Learning endeavors. Figure courtesy of Gayane Karapetyan, PhD Student at CRD.

Statistical Inferencing, a key aspect of Machine Learning, is not a new subject for the Cosmic Ray Division scientists.

In 2002 Prof. Chilingarian partnered with the Huntsman Cancer Research Institute in Salt Lake City, Utah to work with doctors on the advanced field of Gene Expression Analysis, using the ANI statistical inferencing program he had developed for Cosmic Ray analysis. That study was about predicting a person's chances of incurring a particular type of cancer based on the signature of genes, among an array of thousands of genes.

The two scientific articles, co-authored by Prof. Chilingarian with scientists from CRD and the Huntsman Institute, were the second and seventh most downloaded scientific papers from Elsevier Science's Mathematical Biosciences journal (2002).

It would not be the first or last time that CRD would be ahead of the times in recognizing the importance of a new field of study.

Statistical inferencing is at the root of the currently hot topic of Machine Learning and Artificial Intelligence. Of course the original algorithms in the ANI code have to be updated and specifically applied to the particulars of machine learning and Artificial Intelligence. Work on neural networks at CRD has already resumed, based on previously developed neural network hardware and software. CRD is attracting students who are interested in this field who want to learn from the experts at the CRD.

Like other scientific organizations, the CRD is continually inventing and reinventing itself to explore the most currently relevant subjects, which are of practical importance for the benefit of mankind and Armenia.

ANNUAL TEPA CONFERENCE ANOTHER SUCCESS IN 2019



TEPA 2019 Participants on Mt. Aragats

On October 14 through 17 scientists from USA, Russia, Germany, and Armenia gathered together at CRD's Nor Ambert Conference Center for the annual Thunderstorm and Elementary Particle Acceleration (TEPA) conference.

TEPA's organizing committee, comprised of scientists from Armenia, USA, France, Russia and Slovakia, organized a program of high interest to the international scientific community focused on new findings in atmospheric phenomena resulting from thunderstorms.

This annual series, in its 9th year, was initiated by Armenia and intended to rotate between participating countries each year. It was held in Armenia in 2010 in its first year and in Russia in 2011, after which, by popular demand from all the participants, it has been held exclusively in Armenia with scientists attending from around the world.

One of the key features of this year's conference was that the local organization and implementation was conducted almost exclusively by CRD's young scientists, including a tour of the Aragats research stations to introduce first time participants to CRD's important infrastructure.

The TEPA conference continues to be of high interest to NASA, which serves in an advisory role to the organizers.

STUDENT EDUCATION IS A PRIORITY FOR PROF. CHILINGARIAN



Prof. Ashot Chilingarian at his most important task: Educating the CRD students

Prof. Ashot Chilingarian, the head of the Cosmic Ray Division of the Yerevan Physics Institute, is passionately committed to educating his students in the fields of astrophysics, space weather, thunderstorm atmospheric phenomena, machine learning, and artificial intelligence.

Over 20 students have received their PhD degrees in physics or engineering in fields related to CRD's areas of research.

Some of CRD's graduates fuel Armenia's IT industry after graduation and some remain at the CRD to pursue their scientific research there.

These students have a contagious attitude towards excellence. When asked how they plan to keep their work on par with international standards, they respond, "We plan to lead and in some areas we are leading already".

Indeed they are always in the forefront of novel research subjects, thanks to the unique Aragats research stations, the experts at CRD, the expectation of excellence from Prof. Chilingarian, and support from the Diaspora. We are truly blessed to be part of such excellence.

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



DAVIT ASLANYAN: YOUNG MINDS AWARD RECIPIENT



Davit Aslanyan, receiving Prim Minsters award for best Physics Undergraduate student

Davit Aslanyan has recently joined the CRD and will be a key member of the team working on the recently revived CRD project in machine learning and artificial intelligence.

Davit is a full time student at Yerevan State University in the Physics Department, while he is also pursuing his research endeavors at the CRD.

This year Davit won the National Best Undergraduate Student medal awarded by the Armenian Ministry of Education and Science.

Davit's many achievements include being top of his class in academic achievement, first place in the United Nations Development Program's Green Light for Yerevan contest, 2nd place in the regional round of the Astronomy Olympiad, 3rd place in the National Astronomy Olympiad, and 2nd place in Moscow National Research University Higher School of Economics competition in physics

His special interests lay in atomic and nuclear physics, thermodynamics, atmospheric electricity and elementary particles, machine learning, and artificial intelligence.

Davit's interests touch all aspects of practical life. His multidimensional interests make him a valuable asset to the CRD, to YerPhI, to Armenia, and to the world.

SUPPORTING SCIENTIFIC EXCELLENCE IN ARMENIA: DIASPORA CRD PARTNERSHIP



Left to Right: Joe Dagdigian, SCACRD co-founder; Sandy Vaporciyan; Prof. Ashot Chilingarian, CRD head; late Kirakos Vaporciyan, CRD student legacy scholarship donor; and Lisa Dagdigian at the Mt. Aragats Research Center.

January 2020 will mark the 20th year of the U.S. and Canadian Diaspora's collaboration with the CRD. The seeds of this collaboration began with Anahid Yeremian's hike up Armenia's Mt. Aragats where she encountered CRD's Aragats Research Station, a high altitude cosmic ray observatory on the shore of Kari Lij (Stone Lake) and its director Prof. Ashot Chilingarian.

Subsequently, a few months later Joe and Lisa Dagdigian visited the CRD and were equally impressed to learn of Armenia's ranking as one of the top 5 Cosmic Ray research organizations in the world. Joe, Lisa and Anahid decided the Diaspora had to partner with this jewel in Armenia and since then the synergy between the Diaspora and the CRD has been vital to fuel scientific excellence in Armenia.

The Armenian Engineers and Scientists of America (AESA), with headquarters in Los Angeles and chapters in Michigan, New York, and Washington DC have been steady partners with the Support Committee for Armenia's Cosmic ray Division (SCACRD).

CRD and SCACRD members are grateful for Diaspora's support towards Armenia's scientific Excellence.

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.