



CRD FRIENDS

NEWSLETTER



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THUNDERSTORMS AND ELEMENTARY PARTICLE ACCELERATION CONFERENCE



Some of the TEPA2016 participants at CRD's Nor Ambert International Conference Center.

The 7th Annual Thunderstorms and Elementary Particle Acceleration (TEPA) scientific conference was once again held at CRD's Nor Ambert Conference Center on Mt. Aragats from October 3 to 7. This series of special conferences was established by the Cosmic Ray Division in 2010. The investigation of subatomic particles acceleration due to thunderstorms and lightning is a new and growing field of study. This field, pioneered by Prof. Ashot Chilingarian and proposed to the global scientific community, has gained momentum since then. Because of the rapid growth in knowledge in this field, the original attendees decided that this conference should become an annual tradition rotating among participating countries. After being held in Russia on its second year, the participants decided there was no better place than Armenia to hold this annual conference. Since then it has been held at CRD's Nor Ambert International Conference Center.

The conference attracted both seasoned and young scientists from 10 countries around the world who gathered to discuss their most recent data, theories, and simulation results in the quest to understand the complicated and energetic phenomena in the atmosphere just above our heads.

Topics presented in oral and poster reports included Terrestrial Gama-ray Flashes (TGF) and Thunderstorm Ground Enhancements (TGE), both names coined by Prof. Chilingarian for detecting and measuring the effects of thunderstorms and lightning. Other important topics included within this relatively new scientific field were lightning initiating phenomena, radio frequency electric fields produced by atmospheric discharges, particle fluxes, and the effect of cosmic ray electrons on initiating lightning.

As in the past young PhD students from Armenia and the other countries had the opportunity to interact with scientific leaders from around the world during special sessions designed specifically for discussing the projects of the students.

This year's conference was dedicated to CRD's long-time advisor, friend and supporter: Mr. Harutyun Vaporciyan, who passed away suddenly just days prior to the start of the conference.

SUPER EVENTS OF APRIL 20 SHED NEW LIGHT ON ATMOSPHERIC PHYSICS



Ara Babayan and Karen Asatryan repairing the electric field meter on the roof of one of the buildings (completely under snow) at the Mt. Aragats Research station, 10,500 ft. elevation.

Fortunately severe April storms atop Mt. Aragats did not deter CRD scientists from their research. Aragats experiences severe lightning storms during April, and thus offers an excellent opportunity for research.

Lightening has been observed since the dawn of time, but what triggers it remains a mystery. Could it be cosmic rays? A credible theory is that thunderclouds become electrically charged due to collisions of microscopic ice particles in their midst. Since the air between thunder cloud layers is a good electrical insulator, huge electric fields can exist there. Cosmic rays, which are charged particles arriving from space, are accelerated by this electric field. They collide with atoms in the cloud and knock off electrons from the outer layer of the atoms, which in turn collide with other atoms thus creating a chain reaction or “avalanche” condition. This avalanche initiates a pathway for lightening.

Since lightening frequently occurs at mountain altitudes, CRD’s research station on Mt. Aragats is ideally suited for this research. CRD scientists delved into the study of particle fluxes from thunderstorms 8 years ago when their scientists suddenly measured a large flux of electrons, gamma rays, and neutrons at 10,500 ft. elevation during a very severe thunderstorm. After studying all possible sources they began to suspect the lightening itself.

New precise particle sensors and electric and magnetic field meters were installed to make a careful study. Now CRD physicists measure tens of parameters including radio frequency electromagnetic waves and ultraviolet and infrared emissions from the atmospheric discharges.

April is a great month to make these measurements because it is rich with thunderstorms, which sometimes damage CRD’s instruments. There is a constant battle to cycling between measuring, repairing the instrumentation, and measuring again.

LECTURE SERIES FOR MASTERS STUDENTS BY RENOWNED SCIENTISTS



Prof. Chilingarian lecturing at the YerPhi Masters Students Lecture series.

The primary goal of the Master's program at CRD’s parent institute, the Yerevan Physics Institute (YerPhI), is to expose students to complex research topics from laboratories around the world. Lectures are delivered by respected experts in various fields both from Armenia and other countries. Lecturers bring broad, international expertise while also spend a few days interacting with the students one on one and advising them on their individual topics of research. Topics include the fundamentals of experimental physics, research methods, and data analysis.

This series enhances the awareness of Armenian students to exciting and relevant topics in science around the world, and to proceed methodically in high-energy physics and astrophysics. Building on their knowledge gained from this series, their abilities will be strengthened as they conduct their own research for their thesis and beyond.

As of February 2016 Prof. A. Chilingarian has expanded this series to include students of universities in other countries via video conferencing. These are universities which have added high energy atmospheric physics to their curriculum.

Professor Chilingarian and the senior scientists at YerPhI are the primary lecturers; however whenever possible respected scientists from other countries also participate.

In March Prof. Alexander Khodjamirian from Siegen University, Germany lectured on the modern theory of elementary particles. In May Professor Jean Lilensten, research director at the Institute de Planétologie et d’Astrophysique de Grenoble, France lectured on astrophysics.

These new series are proving to be very helpful in catapulting students into the exciting scientific field of particle and cosmic ray physics, including applications that are relevant for daily life.

PROFILES OF CRD STUDENTS



Hripsime Mkrтчyan – PhD student in Cosmic Ray Physics, Yerevan Physics Institute - at the Aragats research center.

One of CRD’s primary functions is to encourage and enable talented Armenian youth to pursue careers in science. Graduate level programs at CRD’s unique research stations attract budding future scientists.

Hripsime Mkrтчyan – PhD candidate, Yerevan Physics Institute

My topic of research is atmospheric physics. Our team and I are going to explain and enhance the understanding of the electrical structure of thunderclouds and conditions that support the initiation of lightning. My dream is to become an excellent scientist and contribute to my home country, Armenia.

Tatevik Sargsyan - Master of Physics, High-Energy Particle Physics and Astrophysics, Yerevan Physics Institute

I have chosen Physics because it is very attractive for me. It dives into the basic nature of how things work. Also it is like an intellectual game and I like the challenge to understand how this game of life works.

Armine Grigoryan – Master of Physics, first year Yerevan Physics Institute.

I did not choose physics; it chose me. We all have an innate desire to understand how the world works. Physics answers questions about the universe. It is more than a subject – it trains my brain to think beyond boundaries.



CRD’s Master’s students: Mher Mantashyan, Armine Grigoryan, Anush Badalyan, Andranik Manukyan (not pictured: Tatevik Sargsyan). Next step is the PhD program.

Anush Badalyan – Master of Science, Yerevan Physics Institute

Physics is crucial to understanding the world around us, the world inside us, and the world beyond us. It is the most basic and fundamental science. Physics challenges our imagination and leads to great discoveries. It affects our lives from healing joints, to curing cancer, to developing sustainable energy solutions.

Andranik Manukyan – Masters in Experimental Physics, Yerevan Physics Institute

I graduated from Polytechnic Institute in 2014 and have a Master’s Degree in the field of Robotics. I have been interning at the Yerevan Physics Institute for the past 4 years. During this period I became interested in nuclear physics and for a deeper understanding of everything. I entered the Master’s program at YerPhi and now I am studying to become a physics researcher.

Mher Mantashyan – Masters in Physics, Yerevan Physics Institute.

Physics is fundamental to how the universe works. I have been fascinated by this question since childhood. I chose physics because I strive to find the answers to this question.

Thanks to the dedication of the CRD senior staff and the support of the Diaspora (CRDFRIENDS), a bright future is within their grasp.

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



Remembering Harutyun Vaporciyan



Harutyun Vaporciyan at the CRD posing by the all-terrain snow vehicle he was instrumental in purchasing.

Harutyun Vaporciyan was one of the most ardent supporters of the Cosmic Ray Division. He participated not only with his generous financial contributions, but with his wisdom, talents, and time.

He learned about the CRD in 2003 when he read one of the articles about CRD's global achievements on such a small budget. He called the support committee co-chair and volunteered his talents, time and finances.

Thanks to Harutyun, the Armenian Engineers and Scientists of America, Michigan section, became engaged as well. The partnership has been fruitful and highly effective. Realizing the need for safe winter transport of the CRD staff to the high altitude research stations, Harutyun lead the effort to identify and purchase two snow mobiles, one all terrain winter car for snow travel and one Ford Mountaineer for the CRD motor pool.

He was a steady supporter of the future scientists of Armenia by generously providing bonuses to the CRD masters and PhD students who studied, got their diploma, and continued to work at the CRD in Armenia.

He passed away suddenly on September 29, 2016. CRD director, staff, students and support committee will always remember Harutyun Vaporciyan as the genuine advisor and supporter we always relied on.

2017 CRD CALENDAR IS HERE!

CRD's calendar, *Spectacular Armenia 2017*, is ready thanks to CRD's graphic designer, Narine Khachatryan, and one of the founders of the Support Committee for Armenia's Cosmic Ray Division, Joseph Dagdigian. The scenes featured in the calendar will take you from ancient Armenia to today with scenes you will not find even on the internet. Photos include old hidden cathedrals, fortresses, the fun of spraying water on each other during Vartavar in Yerevan to the replica of the tall ship *Kilikia*. You will not find these pictures elsewhere, but you can enjoy them daily on your calendar.



2017 Spectacular Armenia Calendar
available for purchase on the website and selected stores

The calendar is available from the www.crdfriends.org website; Armenian Vendor armenianvendor.com website; NAASR in Belmont, MA (617 489-1610); ALMA in Watertown, MA (617 926-2562); Artbridge in Yerevan; at various Armenian events in the USA; or by calling Joseph Dagdigian (978 772-9417). Republic of Armenia commemorative stamp books celebrating CRD's achievements and Mt. Ararat and Mt. Aragats post cards are also available on the CRDFRIENDS website.

These items make perfect Christmas gifts for your Armenian and non-Armenian friends, while at the same time benefiting the work of the outstanding scientists, engineers and students at the CRD in Armenia.

Visit www.crdfriends.org for your gift-shopping needs.

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.