CELEBRATING THE 80th ANNIVERSARY OF PROFESSOR EDWARD A. FRIEDMAN, SCIENTIST AND EDUCATOR

On September 29, 2015, the doyen of the Editorial board of Serdica Journal of Computing, Prof. Edward Friedman, celebrated his 80th anniversary. This special issue is dedicated to the birthday boy in recognition of his numerous contributions: to science, to promoting effective strategies in integrating digital technologies with mathematics and science education, to adapting a software system for the health treatment of rural patients in India and Sub-Saharan Africa, and most recently—to the development of new university courses on raising the awareness of the threat of nuclear terrorism.

Bulgaria-related activities

The year was 1992. I learned from my colleagues Lubomir Davidov, Ivan Stanchev and Radoslav Yoshinov that Prof. Edward Friedman was coming to the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences (IMI—BAS) as a Fulbright scholar. The previous year he had been an invited speaker at an international conference held in the Black Sea resort Albena by IMI—BAS. At that time he had also been invited by the American Embassy in Sofia to speak at a forum on American culture—one of the first cultural events held to mark the start of a new era in US–Bulgarian relations.

What we knew about him at that time was that he was a graduate from MIT, doctor in Physics from Columbia University, Dean of the College at Stevens Institute of Technology. We learned that his recognitions concerning education included the Albert Einstein Medal for Educational Accomplishments from the Governor of the State of New Jersey and an educational medal from the King of Afghanistan for contributions to higher education in that country.

So, I was intrigued with his choice of a Fulbright hosting institution. It turned out that Edward Friedman's main interest was in studying the specifics of mathematics education in Bulgaria, in particular some good practices in the implementation of the digital technologies in inquiry-based style. At that time, a team mentored by Bozhidar Sendov comprising Ph.D. students from the Faculty of Mathematics and Informatics at Sofia University had been developing and implementing the Plane Geometry System (PGS)—a software product functioning as a mathematical laboratory and enabling pupils to construct and experiment with Euclidean objects, to formulate and verify conjectures, i.e., *to do (rather than to learn about) mathematics.* From the very first days of his stay at IMI—BAS Prof. Friedman started playing with this system, studied the models of various mechanical devices implemented in it as dynamic constructions by Svetla Boytcheva, discussed the development of dynamic scenarios on geometric transformations with Lubomir Davidov, and soon suggested a better name for the software—*Geomland (the Land of Geometry).* Two years later Prof. Friedman would write: *While we are working hard in the U.S. to connect mathematical problem solving more to real work experience, Bozhidar Sendov and his team showed another possibility—making the objects of mathematics themselves more concrete and familiar. A combination of these approaches would perhaps be ideal.*

An additional topic of discussion with our Fulbright guest concerning a possible combination of the above approaches was a series of textbooks for 8$^{\text{th}}$–12$^{\text{th}}$ grade in mathematics and informatics launched in 1988 for the Bulgarian secondary school. The authors were researchers and educators in mathematics and informatics (Blagovest Sendov, Todor Boyanov, Teodosi Vitanov, Darina Dicheva, Lubomir Davidov, Chavdar Lozanov, Roumen Nikolov, Evgenia Sendova and Ivan Tonov) who endeavored to implement the positive experience of the Research Group on Education (at the Bulgarian Academy of Sciences and the Ministry of Education) in integrating informatics with other school subjects—mathematics, science and arts. These discussions showed some interesting differences between the goals of mathematics education in Bulgaria and USA—applicability and pragmatism vs. beauty and life of the mind.

My colleagues at the Institute remember dearly Ed's friendliness and warmth (he became *Ed* for all of us), his greeting us with *Добър ден* (*Good day* in Bulgarian), his interest in Bulgarian history, culture and education, his buying tickets for colleagues to fill a whole row of seats in the National opera house. In just a couple of months spent in Bulgaria, when walking in the street, he would be greeted by more people than us, the colleagues who were accompanying him...

Prof. Friedman (left) and Academician Ljubomir Iliev (right) found many common topics of interest—from mathematics and informatics, to music and Saints Cyril and Methodius (the picture is from the IMI—BAS archive, taken in 1993)

This Fulbright scholarship set the foundation of a fruitful collaboration between Bulgarian mathematics and informatics educators and the staff of the Center for Improved Engineering and Science Education (CIESE) founded and directed by Prof. Friedman at Stevens Institute of Technology.

Through the years Ed Friedman had endeavored to foster exchanges and visits promoting mutual understanding in the field of mathematics education. In 1993 he hosted Lubomir Davidov, then President of the Union of Bulgarian Mathematicians, as a Fulbright Scholar at Stevens Institute of Technology. There Lubomir Davidov developed a set of educational modules on geometric transformation by means of *Geomland*. Another visiting scholar at CIESE from Bulgaria was Pavel Boytchev who worked on the development of computer applications to be used with real data in real time in the context of mathematics and science activities. The applications relating to the use of vectors in teaching introductory physics turned out to be especially profitable.

A very innovative Master of Science in Information Systems program was promoted by Prof. Friedman and implemented with the efforts of Prof. Roumen Nikolov (then Deputy Dean of the Faculty of Mathematics and Informatics at Sofia University) as a joint educational project between Stevens Institute of Technology and Sofia University in 2005. The official agreement was signed in Sofia on March 22nd, 2005. The signing event was attended by many representatives of the government authorities, the Bulgarian Investment Agency, leading

business organizations and IT companies, universities and local community. On May 22nd, 2006 USAID, which sponsored the first group of program participants, hosted an official event at the US Embassy in Sofia to celebrate the first year of the program in Bulgaria. Prof. Dr. Edward Friedman gave Stevens certificates to student attendees of single MSIS courses. Present were Mr. Jeffrey Levine, Deputy Chief of the US Mission in Bulgaria, Mr. Michael Fritz, USAID Mission Director for Bulgaria, Roumen Nikolov, directors of companies, representatives of state authorities, students and media.

I personally had the privilege to be welcomed each year for more than a decade as a visitor, after completing my duties as a tutor at the Research Science Institute (RSI) international program organized jointly by the Center of Excellence in Education, VA, and MIT. After the end of the respective issue of the RSI program, the research team of Prof. Friedman and I would exchange ideas on various aspects of inquiry-based mathematics and science education (from structured to open inquiry level) and plan joint activities.

Especially inspiring was a project launched in 1994 by the CIESE team, the goal being to implement Internet resources to reinforce the teaching of mathematics and science in an international school setting. A global classroom and a new infrastructure for education were designed embracing scientists as well as teachers and students from more than 350 schools all over the world. As a coordinator of the Bulgarian participation in this project I would like to share my impressions of the involvement of several schools (in Sofia, Plovdiv and Rousse). The students performed real-life experiments on various topics including acid rain and water quality, gathered data, analyzed trends and patterns on topics of current scientific interest and communicated their findings to the participating scientists. Thus teachers and students were part of a genuine international research team. Even the parents got involved—there was a case in a Sofia school in which a student's father brought a water sample from the Antarctic to be compared with the water they drank at school.

Ed Friedman's contributions to the promotion of good practices in mathematics education between Bulgarians and Americans were significant also in the context of a series of workshops and seminars held in both the US and Bulgaria during the years 1998 through 2006. The events held in Bulgaria were organized jointly by the US organization *Best Practices in Education* and IMI—BAS.

Prof. Friedman's innovative ideas about the implementation of Internet resources to reinforce the teaching of mathematics and science have been greatly appreciated and adopted by Bulgarian math educators and teachers in a school

setting as well as in the context of higher education. His special role in the field of implementing ICT in education was deservedly recognized by the mathematics and science community in Bulgaria—in the year 2000 he received a Sc.D. degree Honoris Causa from Sofia University "St. Kliment Ohridski", and in 2003 he became a Foreign Fellow of the Union of Bulgarian Mathematicians. The same year he was an invited speaker at the Mathematical Society of South Eastern Europe (MASSEE) conference held in the mountain resort Borovets and again at the MASSEE conference held in Cyprus in 2006. In 2008, he was a keynote speaker at the *International* Conference on Informatics that IMI—BAS co-sponsored in Varna.

In 2009, a time difficult for the whole Bulgarian Academy of Sciences, Prof. Friedman expressed his support for IMI—BAS by an official letter to the late Acad. Stefan Dodunekov (then Director of the Institute) as follows: *The IMI—BAS is an important source of scholarship and creativity, as well as a focal point for intellectual exchange with other countries. I can testify to the important role that it has played since 1991 in fostering mutual understanding with educators in the United States in the fields of mathematics and informatics.*

In our recent meetings I was impressed with Prof. Friedman's various current involvements in an international setting—analyzing and promoting an outstanding diagnostic expert system, which had been tested in India, for adaptation in Sub-Saharan Africa. Currently, he is developing and delivering new university courses dealing with preventing nuclear terrorism. On April 26, 2016, Prof. Friedman took part as a leading expert in a forum of the Federation of American Scientists to discuss the Chernobyl power plant explosion on the eve of its 30th anniversary, the lessons learned, and possible implications that this fateful event has for the nuclear industry today.

His family shares his international interests and greatly supports his activities. His spouse, Dr. Arline (AJ) Lederman, a retired fine-art professor, sponsored jointly with him an album on Bulgarian ethnography. His older son, Timur, teaches computer science at the University of Paris, and the yonger, Kerim, teaches anthropology at Dong Hua University in Taiwan. An interesting detail of their connection to Bulgaria is that as children they were using the Cyrillic alphabet to code their messages to each other.

Finally, I could not pass over the support Ed Friedman gave to the Bulgarian national team at its match vs. Mexico at the Round of 16, 1994 FIFA cup. Our poster with ХАЙДЕ НАШ'ТЕ! (*Go Go Go* in Bulgarian) attracted a significant group of people whose enthusiastic encouragement was decisive for

the win with penalties (4:2 for Bulgaria, 1:1 after the regular time).

One of the most passionate fans of the Bulgarian football team, Edward Friedman, at Giant stadium, July 5, Bulgaria vs. Mexico, 1994 FIFA cup.

In this issue

The interviews and the articles included in this issue are all related to Prof. Friedman's main scientific and public interests.

The interviews

I had the honor to address several well-known scientists with the request to answer a couple of questions related to Prof. Ed Friedman's activities and accomplishments:

Sidney Altman, Nobel Prize winner in chemistry in 1989 for his work on the catalytic properties of RNA;

Victor Lawrence, Distinguished Research Professor, Center for Intelligent Networked Systems at Stevens Institute of Technology;

James E. McClellan III, Professor Emeritus of History of Science, College of Arts and Letters, Stevens Institute of Technology;

Charles D. Ferguson, President of the Federation of American Scientists, the leading organization of scientists providing non-partisan information to the US government and public on nuclear weapons and other strategic issues.

The interview with Victor Lawrence was on the phone, and the remaining interviews were through e-mail.

As for the interview with Dr. Ferguson, I did not feel qualified enough to interview one of the "Fifteen People the Next President Should Listen To" (as he was named in 2008 by *Wired* magazine). Therefore I asked Dr. Solomon Passy to take the role of the interviewer in his capacity of foreign minister of Bulgaria (2001–2005), Chairman-in-Office of the Organization for Security and Co-operation in Europe in 2004, and co-author of the hybrid logical machinery. Moni (as I called him many years ago when he was my student in calculus) accepted this role with pleasure because of their common interests and expertise in both science and politics, and their contacts with Prof. Friedman.

The articles

In his article "The human impact factor in the research and development of educational software" **Pavel Boytchev** casts a glance at the educational software he has developed in a constructionist spirit directly or indirectly under the impact of Edward Friedman.

Petar Kenderov and Toni Chehlarova provide examples of extending the class of problems solvable in school by means of computer modeling and present the results of an experiment with such problems in the context of the contest *Viva Mathematics with Computer*.

Edward Friedman shares his involvement in a recent educational experiment held in the US within a troubled inner-city school system and successfully transferred to the highly impoverished areas of Sub-Saharan Africa.

The article by **Roumen Nikolov et al.** presents the authors' vision of learning in a smart city environment.

Radoslav Yoshinov and **Monka Kotseva** focus on the role of the e-facilitator in school in the Inspiring Science Education environment.

Petar Gaydarov and **Konstantin Delchev** present their research on Turan's problem on the maximal distance of a polynomial to the set of all irreducible polynomials. Petar started this research in the frame of the High School Institute of Mathematics and Informatics, affiliated with IMI—BAS, in which he worked under the guidance of Konstantin. Later it became the basis for Petar's participation in RSI and the European Contest for Young Scientists (EUCYS).

The contribution of **Petya Asenova** deals with the informatics education in Bulgaria and various forms of support that young Bulgarian informaticians have been getting through the years. Prof. Friedman's impressions of the Bulgarian educational system are also reflected in the context of an interview she got from him in 1993 for the newspaper *Uchitelsko delo* (*Teacher's cause*).

The last two articles are intended for a wider audience:

Solomon Passy presents his vision on the role of AI and the Internet for an enlightened voting—a topic which is extremely important for both U.S. and Bulgaria, in view of the current Presidential elections in the two countries.

In his speech in the aula of Sofia University on the occasion of his receiving the Doctor Honoris Causa title, **Edward Friedman** makes an interesting connection between St. Cyril and Edison. (The speech is published in English for the first time.)

In conclusion

On behalf of the whole editorial board I would like to congratulate Professor Edward Friedman on his 80th anniversary and wish him warmly good health, happiness in his private life and further success in his extraordinary rich and productive scientific and public life!

Evgenia Sendova
Editor-in-charge