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IT IS NOT ABOUT “BRAIN DRAIN”, IT IS ABOUT “BRAIN
GAIN” – 20 YEARS HIGH SCHOOL INSTITUTE
OF MATHEMATICS AND INFORMATICS

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The authors present the 20-year history of the *High School Student Institute of Mathematics and Informatics* (HSSI) by discussing three main events being organized in its frames – the *Winter HSSI Conference*, the *HSSI Section of the Spring Conference of UBM* and the *Summer Research School of HSSI*. A special attention is paid to a “sister-program of HSSI” – the *Research Science Institute (RSI)*, organized jointly by CEE and MIT (US), and the selection procedure according to which two Bulgarian students get the right to attend RSI. The arguments in favor of the title are strengthened by HSSI and RSI alumni who have been achieving a great international recognition for their research in the years and have been mentoring the next generations of HSSI students (both from a distance, and face-to-face – in Bulgaria).

1. Introduction. It is often the case for us, people who have the chance of working with young talents in the field of science, to hear reproaches that we are contributing to the “brain drain”. Probably it is our fault – we do not explain clearly enough and often enough that our activities are not about “brain drain” but rather about “brain gain” [1, 2]. Our best argument is that in all our “giftedness-related activities” we help young people not only in their scientific development but also in rising their awareness that to be useful citizens to their country they should give their best wherever they are.

It is with joy and satisfaction that we observe the effect of “brain gain” among several generations of alumni of the *High School Student Institute of Mathematics and Informatics* (HSSI, <http://www.math.bas.bg/hssi/>) whose 20th anniversary we are celebrating this year.

2. HSSI – a brief history. The *High School Student Institute of Mathematics and Informatics* was founded in 2000 by the *Union of Bulgarian Mathematicians (UBM)*, *Evrika Foundation*, the *St. Cyril and St. Methodius International Foundation*, and the *Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences (IMI-BAS)* in response to the decision of UNESCO to declare that year as “World Year of Mathematics”. In 2005, the *American Foundation for Bulgaria* joined the founders, and since 2011 *America for Bulgaria Foundation* has been the main sponsor of the HSSI activities. The name “Institute” reflects the endeavor to have an organization that functions like a research organization and according to the principles of scientific life [3]. The HSSI has inherited the good traditions of an earlier movement of the technically creative youth in Bulgaria [4] and has implemented a number of activities carried out in the frames

of the international summer program *Research Science Institute* (RSI, cee.org/rsi) organized jointly by two American institutions: the *Center of Excellence in Education* (CEE) and the *Massachusetts Institute of Technology* (MIT). While the RSI program covers all the STEM fields, the HSSI focuses on projects in mathematics, informatics and information technologies (IT) [5–8]. The participants in HSSI are high school students between 8th and 12th grade (mainly from specialized Science and Mathematics Secondary Schools in the country) who have demonstrated their motivation and potential to do scientific research.

An important component of the favorable local conditions is the environment provided by IMI–BAS in terms of technical and human resources. Many researchers at the Institute devote much of their free time to keep the level of extra-curricular work with talented students at a significantly high level. Their work supports and enables HSSI to assist the intellectual and professional growth of the motivated high school students.

Every participant in HSSI works on a long-term project (on a freely chosen topic) in mathematics, informatics and/or IT under the guidance of a teacher or an expert in the respective field. A written presentation of the project is sent to HSSI to be reviewed by professional researchers. The best research projects are accepted for a presentation at the conference sessions of HSSI.

3. The HSSI events. In the course of a one school year, HSSI organizes three main events – two conference sessions and a research summer school. Let us throw a glance on these events and their development through the years.

3.1. The HSSI Winter Conference. Every year (since the year 2000), in January, about 100 people – students, teachers, researchers, members of the Jury and representatives of the mass media get together to mark the first annual event of HSSI– its Winter Conference.

For many students this is the first real obstacle and initial test for achieving their desires and dreams of young researchers. They expect with enthusiasm and impatience to present their work in front of an appreciative larger audience of teachers and peers, and to be judged by a Jury of professional scientists. The topics vary from discussing basic mathematical facts from an individual perspective through interesting topics arising from Olympiad competitions to unsolved scientific problems. The topics are split in two separate streams: mathematics and informatics/IT. Each student has about 15 min (presenting on a big screen, on a white board or on a poster) to convince the jury in the merit of their project and answer the remarks and the specific questions of the reviewers. The presentation skills are essential for persuading the audience in the importance of the topic and the significance of the results achieved by the student. In many instances the authors demonstrate that they have acquired in depth complex mathematics and informatics notions, and have achieved original results and proofs. The discussions after the presentation are an additional option for the Jury to test the knowledge of the students and their ability to answer more difficult questions. At the end of each presentation the author gets advice about possible ways to improve the project and about other interesting problems related to it. Moments of the conferences in the recent years are presented in Fig. 1.

Based on the merits of the paper and presentation, the Jury judges the works and selects the best ones. Their authors get a medal, a *Certificate for excellent performance* as



Fig. 1. Moments from the presentations in the mathematics branch and in the informatics poster session of the Winter conferences in the recent years

well as an invitation to take part in the traditional interview for selecting two Bulgarian participants in the international RSI program, and to attend the *Student Section of the Spring Conference of the Union of Bulgarian Mathematicians*.

3.2. The HSSI Section of the Spring Conference of UBM. This event of HSSI takes part during the traditional conference of UBM in April, which is unique for Bulgaria since it brings together teachers, scientists, educators and high school students, allowing vast networking opportunities for participants of different background. Similarly to the previous event, the HSSI Section allows high school students to present their research projects in the fields of mathematics, informatics and hardware engineering in front of jury and peers (either on poster, or with a fifteen minute presentation), this time usually with noticeable development of their research presented at the Winter conference. The authors of the best projects from the HSSI Section are invited as a reward to participate for free in a three-week *Summer Research School (SRS)*.

As far as the educators and teachers are concerned, the conference is focused on the important aspects of the modern STEM education and the Inquiry Based Learning (IBL) at its highest levels – the *guided inquiry* and the *open inquiry* [9–11].

3.3. The Summer Research School of HSSI. As mentioned above, this 3-week summer school is for high achieving teenagers, with a pronounced interest in the fields of mathematics, informatics and IT. It combines the best practices from leading programs



Fig. 2. At the poster session of the HSSI section of the 48th Spring Conference of UBM



Fig. 3. Presentation of short-term projects and discussions at SRS (in Uzana – the first row, and in Blagoevgrad)

for high school students in the STEM fields (such as RSI) with the unique opportunities of a dynamic small-scale learning environment. The students work with scientific mentors, traditionally stemming from the Bulgarian Academy of Sciences and guests from international research universities in the fields of mathematics and informatics. Each student focuses on a personal research topic, coming from challenging but viable fields such as Combinatorics, Number Theory, Computing, Modeling and others. The program includes lectures on advanced scientific problems and modern technologies, meetings with representatives of the industry and different academic institutions, soft skills training and discussions on important issues such as ethics in science, responsible research and innovation.

During the first two weeks, lectures and practical courses are delivered to the students, the main goal being to extend their knowledge in topics related to their interests and to offer new problems, potentially the core of short-term projects. During the third week the participants present the results of their short-term projects and exchange ideas for further studies (Fig. 3).

To help teachers improve their mentoring skills, a High School Teachers Workshop is organized during the third week of SRS. Participants are the research advisors of the students' projects, presented at the conference HSSI sessions during the school year.

Since 2015 the SRS enjoys an international component. That year three math profes-



Fig. 4. Kaloyan Slavov and Dimitar Jetchev (above) and Christopher Skinner lecturing to the SRS'15 students

sors came from abroad to deliver lectures – **Christopher Skinner** - Princeton University, **Dimitar Jetchev** – Ecole Polytechnique de Lausanne, EPFL, Switzerland, and **Kaloyan Slavov** – Department of Mathematics at ETH Zürich (Fig. 4). Their lectures covered a large spectrum of modern mathematics – from Kakeya sets to cryptography, game theory and the concept of Nash equilibrium. Since 2016 international students from several continents are attending SRS.

3.4. The interview for RSI – entering a community of researchers. It is at the HSSI Winter Conference that a Jury of professionals selects about 15 projects among 60–80 being preliminary reviewed, admitted and presented to a larger audience of stu-



Fig. 5. Demonstrating various talents to the jury – the Interviews for RSI'19 and RSI'20

dents and teachers, and then invites their authors for an interview at IMI-BAS where they answer questions related to both their academic background and general culture. Furthermore, the students have to demonstrate fluency in English, some talents/hobbies in other fields (singing, dancing, poetry, fine arts, sports, music, etc.), and social skills, e.g. to teach a member of the jury to imitate their talent (Fig. 5).

The Jury includes researchers from IMI-BAS, other research institutions, representatives from *St. Cyril and St. Methodius International Foundation*, *America for Bulgaria Foundation*, and very importantly – RSI alumni. In an attempt to convey the atmosphere during the interviews, let us give you an example of a typical conversation between members of the Jury and the students [12]: *Quote a fundamental theorem proved in the last 50 years which is not the Fermat's Great Theorem*. The student being interviewed formulated (with no hesitation) a result presented by two of his HSSI peers, also applying for RSI. Another memorable answer was given to the question: *What is the next line in the monolog "To be, or not to be, that is the question"*. The student immediately responded: *The question is not "To be, or not to be", the question is "What to be"...*

The Jury smiled at the ambitions of another participant who expressed his regrets that Grigori Perelman has already turned the Poincaré conjecture into a theorem and thus has solved a problem which was both among *Hilbert problems* and the *Millennium problems* – something that deprived our hero of achieving the same. . .

Often it is thanks to the questions of the RSI alumni that the candidates realize that to participate in RSI is not only a great honor but a challenge and a responsibility to pass to the rest what they have learned. Finally, the two representatives are chosen based on their overall performance – the work on a project, the presentation skills, the achievements in mathematics and informatics events, the interview, and last, but not least – on the votes of the rest of the candidates (who have to name the most worthy to attend RSI, besides themselves).

As for the rest, they get the confidence of joining a family of researchers (acting not only on the territory of the Academy but also in modern IT startups) (Fig. 6).



Fig. 6. “You are already part of our community!” – concluding words of the President of UBM Prof. DSc Nikolai Nikolov

4. The Research Science Institute (RSI) – an international program with traditions to follow. The RSI was developed by the Center of Excellence in Education, a non-profit educational foundation in McLean, Virginia. The Center was founded by the late Admiral Rickover and Joann DiGennaro in 1983, with the express purpose of nurturing young scholars to careers of excellence and leadership in science, mathematics, and technology. Central to CEE is the principle that talent in science and math fulfills its promise when it is nurtured from an early age. The RSI program lasts six weeks and is attended by approximately 80 high-school students from US and other nations including Australia, Bulgaria, China, France, Germany, Greece, Hungary, India, Israel, Lebanon, Poland, Saudi Arabia, Singapore, South Korea, Sweden, Switzerland, Spain, Turkey, UK. Once selected, the students go to MIT and work on a research project under the guidance of faculty, post-docs, and graduate students at MIT, Harvard, Boston University, and other research institutions from Boston-area. All the students chosen for the RSI have not only acquired a deep interest in mathematics, informatics and natural sciences but have also demonstrated a great potential for doing research in these fields. The Institute begins with four days of formal classes. Professors of mathematics, biology, chemistry and physics give lectures on important aspects of their field and their own research. The students also attend evening lectures delivered by eminent researchers including Nobel Prize winners. The internships that follow the first week classes comprise the main component of the RSI. Students work in their mentors' research laboratories for 5 weeks. At the end of the internship they present a paper on their research and give an oral presentation in front of a Jury of STEM experts and a larger audience at the RSI Symposium.

For this to be an orderly and seamless intellectual process, it is best to characterize the RSI research paper as a *progress report for a continuing research effort*. Especially important in the process of preparation are the milestones – steps of the process. Typical milestones for the written presentation are: writing about a mini-project using the same sample as the one for the final paper; gradually filing the proposed sample starting with the background of the project, the literature studied and the methods used; considering partial cases and possible generalizations; classifying the cases of failure, etc. Possible milestones for the oral presentation are: speaking for 3 min on a freely chosen topic, presenting the introductory part of the project for 5 min, presenting at a *posterless* session (holding only a sheet with the title of your project) (Fig. 7).

All the milestones are accompanied by a feedback from the tutors who work closely with the students – they read and critique the draft papers, provide editorial remarks, suggest avenues of research and areas of additional background reading, give ideas for improvement of the oral presentations, etc. In general, tutors are the psychological oil if the students experience problems and lack of self-confidence.

Here is what **Dr. Mark Saul, Director of RSI for more than 10 years**, shares about the metamorphosis the RSI students undergo during the program:

For most students, participation in RSI is a highlight of their young lives. They get to participate in a working laboratory, sometimes doing significant work, and sometimes even getting published. They are integrated into the life of the laboratory, bonding with the graduate students and other co-workers. They are often invited to dinner or other social occasions, sometimes even overnight retreats. The mental discipline they must command is considerable.



Fig. 7. Life in RSI – math breakfasts with RSI alumni, warming up tutor sessions, *posterless* presentations, mentorship at Media Lab, an “encore” math presentation, reporting back to HSSI

In only 4 or 5 weeks, they are expected to complete a piece of a project, write a short paper, and give a brief talk. They undergo in miniature the research cycle of a productive scientific laboratory.

And they typically rise to the occasion, often surpassing the expectations of mentors

who have not experience RSI before. I myself have worked with some of the world's most gifted students, and these are certainly among them. However rich this intellectual experience may be, **the most valuable aspect of RSI, the one that will form the students' identities and make the deepest impression, is the social experience.** Students' most valuable asset in the program is each other's company. They learn from each other, unwind with each other, and find intellectual peers that they may never otherwise find. Lifelong relationships are forged, and the name "Rickoid" becomes part of their identity. I frequently meet Rickoids decades after I worked with them, and the first they we talk about is memories of RSI.

I can give one vignette, one picture of RSI, that I saw over and over. The students arrive on campus, typically, not knowing anyone else. They have been the most important, the most advanced, the most valued student in their home schools. So they are accustomed to being impressive, being admired, being identified as nerds. That first day, at the first social meeting in a lounge, they typically try to play the role of 'impressive nerd'. And quickly find that it won't work, that whatever achievement they talk about has been surpassed by someone else in the room. They are among intellectual peers, often for the first time.

And the identity of 'nerd', often a defense against the social stigma of being 'a brain', quickly falls away. Their rough edges get rubbed off, one against the other, and the personality, the emotional core of their being, shines through. I've seen it year after year. It is as if they are shedding a heavy burden, or removing an iron mask. And the rest of the summer is spent in a community of peers, of young people who understand and support each other on the deepest emotional level. It is this experience that I see as the most valuable in RSI, an experience that will last them their entire lives.

5. Bulgarian performance of HSSI students at RSI and other international forums. The Director of CEE, Ms. **Joann DiGennaro**, expressed her satisfaction with the Bulgarian participants at RSI, as follows:

*The national significance of having Bulgarian students at RSI can be measured by the visibility provided by CEE to the international community about the strong academics of Bulgaria. The camaraderie of high ability students from Bulgaria with other tremendously high achieving students from other nations, and **the fine achievement of your students in U.S. academics, is a source of pride to your nation.***

These words are well justified by the traditional high scientific performance of the Bulgarian RSI students including getting the recognition of the "top five" in all fields for RSI'01, '03, '04, '08, '09, '11, '12, '13, '14, '16, '18 and '19, which means – the best written/oral presentations in their respective fields.

Furthermore, the HSSI students show the strength of the Bulgarian academic school for working with young researchers at many other international forums, e.g. **ISEF**'13, '14, '15, '16, '17, '18, 19; **EUCYS**'14, '16, '17, '18, '19 (Fig. 8). It is worth mentioning that there are asteroids with the names of **Rumen Dangovski** and **Petar Gaydarov** for their achievements at ISEF'14 and ISEF'15, respectively.

Many of the HSSI alumni have publications in professional journals (sometimes in co-authorship with colleagues from BAS); deliver invitational talks at prestigious universities in the world (including at conferences and seminars, organized by IMI-BAS), and most importantly – mentor the next generations of HSSI – both in Bulgaria and from a distance. Let us hear them.



Fig. 8. Preparations and achievements at ISEF/EUSYS

6. What the HSSI alumni share. Stanislav Harizanov (RSI 2000, Assoc. Professor at the ICT& IMI-BAS): *My participation in RSI 2000 was a turning point in my life. For a first time I faced a problem which I was not expected to solve for four and a half hours. The experience was very different and somehow – more real. . . The unique atmosphere during the 6 weeks convinced me ultimately that my future is linked to the Academy. I was detached for a long time from the magic of HSSI, but during the last 4–5 years I got back on track and **with joy, pride and satisfaction I can boast with a whole soccer team of young, clever and enthusiastic members of HSSI with whom we work successfully** on more theoretical as well as on more practical problems.*

Kaloyan Slavov (RSI'01, postdoc in ETH Zurich, Switzerland): *Along with HSSI, I am also celebrating 20 years – since the first time I had the chance to engage in mathematical research. It was back then that I developed my intellectual curiosity for mathematics. I would write down a statement, put a question mark at the end, and ask myself: is this true or false? Then my investigatory spirit kicks in: What would be the reason for this statement to hold? Can I add some assumptions under which I can actually prove it? Are all of these assumptions necessary? Can I relate it to some other, familiar statement? What would this statement imply, if true? These are some of the questions I have been asking myself in the last 20 years. Learning to pose questions to myself was the first step in my training as a mathematical researcher. Giving even a little bit of an answer can be so rewarding that research has become an addiction for me. A good one. Of course, sometimes the questions get hard and one could get discouraged.*

But then I remind myself of my experiences already as a high school student – come on, I was able to answer research questions that I was curious about back then, why not now as well, given my additional training and experience? **Mathematical research has been the source for my intellectual satisfaction since my first participation at HSSI and until now.** I am grateful to HSSI for the push it gave me so that my professional life can take this most rewarding direction.

Konstantin Delchev (HSSI'01, Director of an Intel ISEF affiliated fair): What did HSSI give me? Basically, it taught me how to do research in the fields of mathematics and informatics. The change from the schoolboy mentality, where you have to solve the problems on the blackboard (or else), to the scientist mentality, where you have a problem that you investigate and no one knows what will happen. To a large extent, this is what pushed me towards a scientific career. What is my motivation to work with students? **A lot was invested into me, in terms of time and efforts, from people who were capable and experienced scientists in their respective fields.** They had decided to detract time from their own to work with us. After I graduated, I decided I should return the favor and in turn start helping students. **I still feel I have much to learn from the ways I was taught, but the success of my own students indicates that I might be doing some things right, after all...** The hardest part of working with students is actually the beginning – the research topic. Too challenging research topic means no results and tons of frustration. A low hanging fruit means no meaningful results and nothing learned. And it is not like you can always figure out the difficulty of an open problem in advance.

Todor Bilarev (HSSI, RSI'06) By participating as a student at the summer schools and conferences organized by HSSI, and subsequently RSI, I discovered the beauty of doing research in Mathematics, something that I do ever since. So, definitely, being a part of the Institute as a student shaped my future even as a professional – I recently finished my PhD in Mathematics and continue doing research. **Now, as a more experienced mathematician and being back in Bulgaria, I am happy and feel privileged to be around the very talented young generation** and to contribute to the success of the Institute by taking part in RSI interviews and hopefully as a mentor in some of the future summer schools.

Katerina Velcheva (HSSI and RSI'10, PhD from Stanford): From my entire experience in doing research, I think that what matters the most is to not give up and to not hope! Sometimes the results come slowly but it is worth pursuing them. There is no greater euphoria than proving something you have been struggling with for months. Sometimes, it is better to leave the problem for a day or two (even for a semester) and go back to it from a new perspective... **To be a mentor is an activity in which at the beginning one expects to give only and not to receive anything in return. The truth is that there is no greater reward than seeing the euphoria of your mentees when they learn and discover something new** or solve a problem which has taken them a significant amount of time. As someone who has been a passionate competitor in mathematics and informatics as well as author of research projects, I thought that the greatest joy is to solve a challenging problem. While guiding two high school students from my native town, I understood I have been wrong – to witness their happiness after they have achieved reportable results, made me even more proud...

Todor Markov (RSI'11) – the HSSI was my first encounter with longer-term,

bigger projects, instead of small self-contained problems – the kind that actually appear in life. RSI was my introduction into more formal, structured research. **But it (and later my studying in the US) also allowed me to meet new people, experience a different culture, and see new perspectives towards problem solving, social issues, and everyday life. I always intended to remain in Bulgaria where my family is, and I think it's a good place to live in - sure there are problems, but that's true everywhere.**

Kalina Petrova (HSSI, RSI'12, PhD student in theoretical computer science at ETH Zurich): HSSI has played a great role in my learning how to write scientific text, how to present my achievements and how to speak in public. The conferences and the summer schools have given me the kind of scientific interest that drives me to explore every unfamiliar concept and to delve into every unconventional idea I get... Working on a real piece of software at RSI definitely had its challenges and it helped me develop my thinking a lot... In my high school years I had the opportunity to (try to) conduct scientific research, both on my own and with the help of others. There are many people that have contributed to the person I am right now. **I would like to help other people from my country develop their full potential and make the most of their high school experience.**

Rumen Dangovski (HSSI, RSI'13, EECS PhD student at MIT): By attending the Summer Research School (SRS) of the Bulgarian High School Student Institute of Mathematics and Informatics, I learned to actively engage in research with my peers and professors. To ask about others' work, engage in conversation, brainstorm and collaborate are the most useful skills from SRS that I carry with me during my research at graduate level. **After graduating from high school, I have been working with students in Bulgaria to find opportunities for collaboration and help them represent Bulgaria's stellar research environment around the world.**

Yani Pehova – (HSSI, a PhD student at the University of Warwick, UK): With a passion for mathematics, I naturally went to several HSSI summer schools and conferences. Looking back at the work I did and the friends I made, it's safe to say that HSSI cultivated me as a mathematician and raised me as a human being. It did its job pretty well too, what came in was a 15-year-old girl and what came out was a Cambridge offer-holder... Being a supervisor for HSSI has been one of the most rewarding things I have ever done. As a mathematician, I was more or less raised by the conferences and summer schools during which HSSI set me on an academic track and this is something I'm surely grateful for. **So as a supervisor, I both got to experience the atmosphere of these conferences one more time, and had the opportunity to express my gratitude towards the people who helped me keep my interest in mathematics alive...**

In her electronic student post *Keep in Touch* from 2014 [13] Yani Pehova made a statement which inspired the title of our paper:

*People in Bulgaria say that each year more and more brains are draining out of the country as more European countries are opening their borders, hearts and universities for Bulgarian students. They are mostly correct and obviously disappointed, a bit irritated too, but they often fail to notice that **very few of us forget where we came from...** [...] Some of the best young mathematicians of Bulgaria may be scattered around the world, each one of them doing their own thing and going home only for holidays. **But***

no matter where we are, a lot of us find a way to say thank you and stay in touch with the HSSI.

As many of the researcher have experienced, teaching is very valuable to their research. This is also seen from the thoughts of the young researchers and mentors quoted above. By mentoring and guiding the next generations of young minds they also pass the awareness that *approaching the work with genuine interest in research and discovery rather than winning competitions is far more valuable in the long-term* [14].

7. Conclusion. We are aware that *the education is one of the most important applications of science* – words of **Acad. Petar Kenderov**, one of the founders of the Bulgarian school for working with young talents in mathematics and informatics. It is in the same spirit that Stefan Dodunekov (the late President of the Union of the Bulgarian Mathematicians and President of the Bulgarian Academy of Sciences) talked on a previous celebration of HSSI:

Acad. Stefan Dodunekov: *Even if HSSI would be the only thing left after us, as educators, I would be endlessly happy. I feel very proud for having the chance to be able to contribute to the founding of this Institute. Nurturing and stimulating young talents as well as the development of mentoring skills of the mathematics and informatics teachers are extremely important.*

The programs and forums, discussed above, give a new glance towards the relationship of the high school students and science – *not to learn about it, but to do it!*

What happens in HSSI is a genuine example of inquiry based learning where the students are “discovering” the knowledge themselves by searching the existing classical literature and Internet resources, by combining in an original way known facts and, not rarely, obtaining new results about the studied topic. The teachers (mentors in our case) help the students develop the necessary research skills (analytical thinking, formulation of conjectures, experimental check of the conjectures etc.) and guide the overall process of work.

In fact, our duty (as a small part of the people working in gifted education), is to encourage students *to enter the shoes of scientists*, i.e. to learn and work in inquiry-based style at the highest levels.

After quoting so many researchers (young and not so young) we would like to end our reflections with the words of a very gifted non-scientist, Stefan Valdobrev (actor, film composer, singer-songwriter and filmmaker): *A beautiful generation is growing!* This thought is being proved for 20 years now by the young members of HSSI. And everyone who could contribute to this growing should feel privileged. Happy anniversary, HSSI!

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REFERENCES

- [1] Е. СЕНДОВА. Расте прекрасно поколение („изтичане на мозъци“ или вливане на надежда). Наука, бр. 4 (2014), 53–55.
- [2] Е. СЕНДОВА. Млади сили в крепостта на науката. Наука, бр. 6 (2004), 57–61.
- [3] P. KENDEROV. Higher Ability Students and Inquiry Based Learning in Bulgaria – the Role of European Projects InnoMathEd and Fibonacci. Proceedings of the 6-th Conference of the World Federation of National Mathematics Competitions (WFNMC), Riga, July 25–30, 2010.
- [4] P. KENDEROV. One year HSSI, Sofia, 2001, 1–3.
- [5] П. КЕНДЕРОВ, О. МУШКАРОВ, Б. ПАРАКОЗОВА. Петнадесет години Ученически институт по математика и информатика. *Математика и математическо образование*, **44** (2015), 41–56.
- [6] П. КЕНДЕРОВ, О. МУШКАРОВ. Десет години ученически институт по математика и информатика. *Математика и математическо образование*, **39** (2010), 7–18.
- [7] O. MUSHKAROV, A. RANGACHEV, E. SENDOVA. Entering the world of mathematics research at school age. *Mathematics and Education in Mathematics*, **38** (2009), 92–94.
- [8] O. MUSHKAROV, N. DIMITROVA, E. SENDOVA. Math Research at School Age. 6th chapter in: Meeting in Mathematics (eds V. Georgiev et al.). Sofia, 2008, 81–93.
- [9] P. KENDEROV, E. SENDOVA. Enhancing the inquiry-based mathematics education. In the Proceedings of the UNESCO, International Workshop: Re-designing Institutional Policies and Practices to Enhance the Quality of Teaching through Innovative Use of Digital Technologies, 14–16 June 2011, Sofia, Bulgaria, 56–70.
- [10] P. KENDEROV, E. SENDOVA. Inquiry Based Mathematics Education (IBME) and Gifted Students. In: Implementing Inquiry in Mathematics Education (eds P. Baptist, D. Raab). Bayreuth, 2012, 163–174.
- [11] E. SENDOVA. You do – you understand, you explore – you invent: the fourth level of the inquiry-based learning. In: Constructionism and Creativity (eds G. Futschek, C. Kynigos). Proceedings of the 3d International Constructionism Conference, August 19–23, 2014, Vienna, Austria, 103–112.
- [12] Б. ПАРАКОЗОВА, Е. СЕНДОВА. Когато да бъдеш изключителен не е изключение. (интервю на отличници от УЧИМИ за RSI 2010). *Математика и информатика*, бр. 1, 2010.
- [13] Y. PEHOVA. Keep in Touch. <https://murrayedwardscollegegoingplaces.wordpress.com/2014/04/24/keep-in-touch/>.
- [14] S. GAGLIANI. Preface to “Success with Science: The Winners’ Guide to High School Research”, Research corporation for science advancement, 2011, xi–xii.

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**НЕ „ИЗТИЧАНЕ“, А „СПЕЧЕЛВАНЕ“ НА МОЗЪЦИ:
20 ГОДИНИ УЧЕНИЧЕСКИ ИНСТИТУТ ПО МАТЕМАТИКА
И ИНФОРМАТИКА**

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Авторите проследяват развитието на Ученическият институт по математика и информатика (УЧИМИ) от създаването му през 2000 г. до днес, като се спират на основните събития, организирани в рамките му – *Зимната ученическа конференция*, *Ученическата секция* към Пролетната конференция на СМБ и *Лятната изследователска школа*. Отделят внимание и на родствената международна програма *Research Science Institute (RSI)*, както и на селекцията на българските ученици за участие в нея.

Защитата на твърдението в заглавието личи най-добре от думите на випускниците на УЧИМИ и RSI, които освен с личните си научни постижения на престижни международни форуми, допринасят за научното развитие на българската младеж и като ментори (както от разстояние, така и на родна почва).