

Scientific and Professional Work of Academician Aleksandar Marinčić – Contribution to the Development of Telecommunications

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Abstract – On the 12th of May 2011, professor Marinčić left the scenes of life but deep and indelible traces of his creative work in science and education are still present, with the significance that continues to grow everyday. Contribution of professor Marinčić to the development of telecommunications and electrical engineering in general, as well as the international reputation of our scientists, is tremendous. Considering his contribution to the development of the ETRAN Society (expert sections: Antennas and Propagation – AP, Microwave Technique – MT and Telecommunications) and the establishment of the National Society for Microwave Technique, Technology and Systems, a special section devoted to his rich professional and scientific work was held at the ETRAN 2012 Conference, within the MT expert section. This work represents an introduction of the aforementioned section. Here will be given a summary of the most important results in science and education of academician Marinčić, a respected professor, great scientist and a highly remarkable man.

I. INTRODUCTION

Creative work of academician Aleksandar Marinčić as well as his field of study was very broad and crowned with brilliant results. This great scientist, respected professor and above all, a noble man, left an indelible trace in the Serbian and world science. The impressive fact is that he had a broad spectrum of scientific interest and gave his expert contribution in almost every filed of electrical engineering. His great loves were telecommunications and high –frequency techniques [1-7].

Professor Marinčić with a great enthusiasm taught a large number of lecture courses on microwave technique and optical telecommunications. Highly motivated to introduce the innovations, he established a number of new courses at the universities where he was working, and thoroughly reformed many existing courses. His textbook „Opticke telekomunikacije“ is one of the most read books in the university libraries in our country.

Besides the lectures, he had always time to work with young people. Considering the number of diploma, master and PhD thesis he supervised, he was one of the most prolific professors at the Faculty of Electrical Engineering in Belgrade. The communication of the SANU (Serbian Academy of Science and Arts) the best illustrates how great promoter of science among young people he was: „ *He is*

going to be remembered for his strong will to develop and promote the science, especially among young generations“ [2].

Professor Marinčić has intensively studied and popularized the scientific work of Nikola Tesla and Mihajlo Pupin. He was the Director of the Nikola Tesla Museum for 14 years, editor of the Selected Tesla Writings, successful organizer of symposiums and exhibitions devoted to Tesla, the Director of the Gallery of Science and Technique SANU (Fig. 1).

Scientific and expert work of academician Marinčić was very extensive, accompanied with numerous contributions in solving practical problems, especially those representing experimental verification of theoretical assumptions [3]. As acknowledgement for his scientific and research work, he was elected as a full member of the Serbian Academy of Science and Arts and a full member of the Engineering Academy of Serbia.



Fig. 1 Great contribution of professor Marinčić to the development of telecommunications and electrical engineering in general, makes his creative work and scientific vision immortal – Professor Marinčić next to Tesla Coil

Taking a look into the history of ETRAN Conference, it can be concluded that professor Marinčić was one of the participants with the longest experience, presenter of numerous papers and verily, one of the major contributors to the development of the ETRAN Society. Besides the awards he received for his scientific and professional work, the

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ETTRAN Society decided to organize a special section at ETRAN 2012 conference, devoted to his scientific work. The initiative came from the National Society for the Microwave Technique, Technology and Systems (MTTS), whose founder was professor Marinčić. This paper, which is a brief overview of his work, represents the introductory paper of the aforementioned special section.

II. BIOGRAPHY OF ACADEMICIAN MARINČIĆ

Aleksandar Marinčić was born on July 9, 1933 in Sinj (Croatia) by father Stevan and mother Katica, born Zanki. Aleksandar grew up with an older sister Marija and a younger brother Nebojša. He was a year and a half when his family moved to Belgrade. The reason for moving to the capital was to provide adequate education to the children. Many years later, as a soldier in Split, he had an opportunity to see the house where he was born. Everything he later remembered was related to Belgrade, and to the romantic landscape of Čubura where he grew up and graduated in the Third Men's Gymnasium. „I feel like I belong to Cubura“, he often said. „As a four-year child I have learned to read and write with my older sister Marija. I was a sickly child, but with living spirit and rather self-conscious of my age“, Aleksandar often recalled his happy childhood.

After Gymnasium, in 1951 he enrolled the Faculty of Electrical Engineering, University in Belgrade. He listened the first lectures on measurements in telecommunications by professor Vojin Popović but he gained the strong interest in this field of electrical engineering at the lectures of professor Jovan Surutka. He was always proud to say: „Thanks to professor Surutka I discovered the world of telecommunications, antennas and microwave technique, but both of them (professors) made on students strong impression and we followed their development“. Supervised by professor Jovan Surutka, Aleksandar graduated in 1956 as the first and the best student in his generation, with high average mark 9.53. During the studies, he met his future wife Mira with whom he got two sons, Srđan and Dušan (Fig. 2 and 3).

He continued his MSc studies at the Faculty of Electrical Engineering in Belgrade, where he received MSc degree as a first postgraduate student. In 1958, he was employed as an Assitant for the course Measurements in Telecommunications (professor Vojin Popović). The most significant influence on his future scientific work made the Doctoral studies at the University of Sheffield in England, where his supervisor was professor Aleksandar Kalen. In the World War II, prof. Kalen designed radar systems, and was the Head of the Department of Electrical Engineering at the University of Sheffield. Right there, young MSc degree holder Marinčić successfully defended his PhD thesis „Measurement of dielectric constant in the millimeter wave band“. In 1965, he promoted as Assistant Professor at the Faculty of Electrical Engineering in Belgrade.

In 1967, professor Marinčić left Belgrade and moved to Ankara, in Turkey. He worked as an UNESCO expert with the highest degree P-5, Visiting Associate Professor and Acting Chef Technical Advisor at the Middle-East Technical University in Ankara. The coordinator of the project was professor David

Tombs, who once used to teach professor Kalen in London. Prof. Tombs made it a habit to call him „my grandchild“. In Ankara, professor Marinčić thought courses in the field of electromagnetics, microwaves, antennas and measurements. Also, he supervised two PhD and seven MSc thesis.



Fig. 2. Young engineer Marinčić with his wife Mira



Fig. 3. Professor Marinčić with his son Dušan and grandchild Marko

In 1971, he came back to Serbia and started his work at the Faculty of Electronic Engineering in Niš where he was elected as an Associate Professor. In addition, he was a Vice-dean and the Head of Telecommunication Department. In 1974, he returned to Belgrade, where he also promoted as Associate Professor and then, in 1980, as Full Professor. He worked in Belgrade to his retirement in 1998. Three times with two-year terms he was elected as the Head of the Department of Electronics, Automatics and Telecommunications. During four years he was the Head of Telecommunications Department. For one year he was the Head of Military air-electronics section at the VTVA in Zarkovo.

In spite of his serious illness, professor Marinčić remained active until the last day of his life. In 2010, he participated in planning and realization of ten exhibitions and accompanying lectures in the Gallery of Science and Technique SANU. He held a lecture related to lasers in telecommunications, worked on the encyclopedia, and co-authored a paper published in the leading international journal.

III. TEACHING ACTIVITIES

Prof. Marinčić with great enthusiasm taught courses on telecommunications. He did it very professionally and put a lot of effort to effectively transfer the latest knowledge to young people. Therefore, his lectures were very popular among students. At the Faculty of Electrical Engineering, he taught the courses: Measurements in telecommunications, Fundamentals of Telecommunications, Data Transmission, Lightguides, Optoelectronic Telecommunications and Optoelectronic Devices and Systems. Besides, he taught several advanced courses on telecommunications to postgraduate students, including Microwave Technique and Microwave Circuits. At VTVA in Zarkovo, he lectured Optoelectronic Systems and Microwave Technique.

At the Faculty of Electronic Engineering in Niš, Prof. Marinčić thought the following courses: Electrical Measurements, Fundamentals of Telecommunications and Microwave Technique (Technique of Hyper Frequencies) [4,5,6], and at the Faculty of Technical Sciences in Novi Sad Fundamentals of Telecommunications and Radio and Cable Communications. He was two times a Visiting Professor at the universities in England and once in Wales.



Fig. 4. With great enthusiasm, Prof. Marinčić transferred his knowledge in the electrical engineering to his students (Lecture at the exhibition devoted to Nikola Tesla – TELSIS 2001).

Prof. Marinčić wrote textbooks in the field of microwaves and optoelectronics (Microwave and Optoelectronic Technique). His textbook and workbook for Optical Telecommunications were very popular among students of electrical engineering. With his colleagues, Prof. Marinčić founded the Laboratory of Optoelectronic Systems at the Faculty of Electrical Engineering in Belgrade. Although

burdened with many activities, he always had enough time and energy for additional work with young students, future professionals and scientists. He supervised a number of diploma thesis, about 50 MSc thesis and 18 PhD dissertations at three universities in the country and abroad.

Having in mind his approach in the organization of lectures and the professionalism of his work with students, it can be said that Prof. Marinčić set high competency standards for teachers working in the higher education institutions (Fig 4).

IV. SCIENTIFIC ACTIVITIES

In primary school, Marinčić has demonstrated his talent in technical sciences. At that age, he started to read biographies of great scientists like Faraday, Davy, Tesla and others. He started to „experiment with wires” - to make detectors and antennas. The book „Electrical and Steam Engines for Amateurs“ written by a Russian author, inspired him to make his childhood dream come true: to design a steam engine, turbines and different electrical motors. In the 8th grade, he gave a lecture on the physics class about alternating current motors and he showed his little universal motor. At that time, he didn't know what are Rotating Magnetic Field and Tesla Motor. Professor Marinčić usually said that at that age, he loved mechanical engineering more, but an inner voice overpowered his first love: mechanical engineering was his hobby whereas the electrical engineering was his profession.

Regarding scientific activity of professor Marinčić as well as his skills to successfully translate the scientific ideas from the theoretical domain into the realm of practice, here is a citation of academician Antonije Đorđević: „He had a wide spectrum of scientific interests. He was a renaissance-type scientist. He was an excellent theoretician, skilled in the practical application of numerical methods, and had „golden hands“ as an experimenter” [3].

Academician Marinčić published over 280 papers from the domains of microwaves and optoelectronics. Of these, over 50 papers were published in the eminent foreign periodicals, 50 in the proceedings of international conferences with 4 invited papers, 15 papers in national periodicals and more than 100 papers presented at national conferences. It should be emphasized that he delivered more than twenty invited lectures about his work at the universities and institutes in Yugoslavia, England, Italy, Holland, Belgium, Spain, Greece, Wales, Israel and Poland.

Despite his ill-health, professor Marinčić did not give up but with new inner strength began to expand his research interests. As he wanted to tackle the most difficult problems in telecommunications and electrical engineering in general, in the last period of his life he did modelling and computer simulations of semi-conductor lasers, optical amplifiers, MOSFET detectors, optoelectronic systems and various modulation techniques (polarization modulation, direct frequency modulation of lasers, CDMA technique for use in LAN networks...). Also, he dealt with thermal imaging processing, laser guidance, microwave resonant cavities, horn antennas, balanced transformers, etc.

His papers were cited more than 80 times in foreign periodicals and over 70 times in national proceedings and periodicals. He published two monographs in Serbian.

Professor Marinčić was elected as a corresponding member of the Serbian Academy of Science and Arts in 1991 and a full member in April 2000. Also, he was elected as a full member of Yugoslav Engineering Academy from its formation in 1998.

V. SCIENTIFIC RESEARCH PROJECTS

The academician Marinčić ardently managed and participated in various projects to resolve practical problems in the field of modern telecommunications. The quality of his research work and his innovations applicability is best illustrated by the highlighted fact in the official proposal for Prof. Marinčić admission into the Serbian Academy of Science and Art (SANU), which states that most of his scientific contributions either “are oriented towards solving practical problems “or “have immediate applicability in practice and are in good agreement with theoretical and experimental results”.

The initial research of Prof. Marinčić was focused on microwave technique applications (at the Institute “Mihajlo Pupin”) and modelling of horn antenna, while his later research was dedicate to the design and realisation of balun transformer (results have been repeatedly cited in the literature) as well as to optical fibers for transmitting the larger amount of data and modelling of semiconductor lasers and optical amplifiers.

In the period 1991-1995 Prof. Marinčić was in charge of the project “Electromagnetism, microwave technique and optical communications”, which was funded by the Serbian Ministry of Science and Technology. More than 50 researchers from the 3 faculties and 2 institutes from Belgrade, Nis and Novi Sad participated in this project. He was also a leader of major project in period 1995-2000 as well as of project “The Development of cable television in Serbia” for the purposes of Radio Television Serbia (RTS) whose results were published in monograph. Prof. Marinčić took part in an international project supported by the European Economic Community COST 1971-1974 and later had a good cooperation with University of Nottingham.

Prof. Marinčić eagerly collaborated with numerous research institutions (i.e., Institute “Mihajlo Pupin”, Military Technical Institute, Institute of Microwave Engineering and Electronics, Institute of Applied Physics, Institute EI-IRI from Nis) and a factory “Novkabel” from Novi Sad. As a part of this cooperation, he worked on the design and realisation of small capacity radio relay devices, the first devices of that kind in Serbia, along on the development of microwave barriers, microwave ovens, special applicators for paper industry and optoelectronic devices. One of his researches, on demand of one lab from the USA, was focused on the applicability of multimode and monomode lasers for feedback channel in cable television. The research in this field is synthesized in the book *Optical Communications* and course book *Optoelectronics and Optoelectronic Systems*.

VI. STUDY AND POPULARISATION OF THE WORK OF NIKOLA TESLA AND MIHAJLO PUPIN

Academician Marinčić made enormous contribution to the preservation of science and work of great Nikola Tesla and Mihajlo Pupin. He studied their work with immense love and devotion and was the major promoter of their ideas among the academic and wider community in Serbia and abroad. Many Serbian prominent scientists are impressed by Prof. Marinčić comprehensive explanations of Tesla and Pupin work, discovering the intriguing parts of their lives that were not well known to the general public.

Academician Marinčić wrote various articles and books about Tesla’s personal and professional life. He was the editor of the *Selected works of Nikola tesla* (7 Volumes), which are also available in English. He wrote the introduction and notes for the Serbian and English edition of the book “*Diaries of the Research from Colorado Springs 1899-1900*” (translated by V. Popović), and the monograph “*The Life and Work of Nikola Tesla*”. The eight chapter of the book “*The Great history of Radio*” edited by Prof. Tapan Sarkar from Syracuse University and dedicated to Tesla’s contribution in the field of radio engineering, was also written by academician Marinčić. He had been associate of Nikola Tesla Museum since its establishment in 1956. Famous physicist Niels Bohr visited this museum in 1956. In period 1982-1996, Marincic was the head of Nikola Tesla Museum in Belgrade and a long term chairman of the Society for dissemination of scientific achievements, and since 2000 he had been a president of the Memorial Society “Nikola Tesla” based in New York.

Prof. Marinčić invested his time in organising international symposium “Nikola Tesla” in 1991, 1996, 2001 and 2006, respectively. He, along with his associates, was the author of 3 major exhibitions on the life and work of Nikola Tesla at the Serbian Academy of Science and Art. Some parts of these exhibitions were displayed in Tokyo, Barcelona , Mexico and most Serbian cities (Fig.5).



Fig. 5. Prof. Marinčić studied Nikola Tesla’s work with immense love (Exhibition about Nikola Tesla, organised by Prof. Marinčić in Mexico, 2007)



Fig. 6. Prof. Marinčić receiving the award “ Notable citizen of Idvor”

When it comes to Mihajlo Pupin, Prof. Marinčić wrote notable introductions, prefaces and notes in several books dedicated to this great mind of Serbian science. His translation of Mihajlo Pupin’s biography “ From Meadows to Scientist” is considered to be the best translation up to dates. His very interesting explanations and notes became inseparable part of this book about Pupin. In 2004 Marinčić published 4 articles in honor of the 150th anniversary of Pupin’s birth. Prof. Marinčić received a prestigious award “Notable citizen of Idvor”, a Pupin’s birthplace, for his remarkable contribution in preservation and popularisation of the Mihajlo Pupin’s work (Fig.6).

VII. CONTRIBUTION OF ACADEMICIAN MARINČIĆ TO MTTs AND ETRAN SOCIETIES

Prof. Marinčić is the founder of the National Association for microwave technique, technology and systems (MTTS). His contribution to the development and organisation of this society is invaluable. He was in a long term the IEEE MTT Chapter Serbia Chairman. He was awarded for his outstanding contribution to organising IEEE MTT S Chapter in region by IEEE [4].



Fig. 7. Prof. Marinčić, prof. Antonije Đorđević and Prof. Bratislav Milovanović between the ETRAN sessions in Herceg Novi , 2003

Prof. Marinčić also contributed tremendously to the development of ETRAN Society, the largest Serbian professional association in the field of electrical engineering, and particularly to development of Chapters: Antennas and Propagation, Microwave technique, technologies and systems, Telecommunications. He holds the record for the number of presented papers at ETRAN Conferences (Fig.7). He was a longtime member of the ETRAN Board and Program Committee. For his enormous contribution to this Society, he was selected to be an honorable member [4].

VIII. SUPPORT TO TELSISKS CONFERENCE AND OTHER ACTIVITIES

Prof. Marinčić provided great support to the establishment of prominent international scientific conference TELSISKS. From the very beginning, since 1993, he had been dedicated to TELSISKS organisation and undoubtedly contributed to the current high international and scientific rating of TELSISKS Conference [4] (Fig.8 and Fig.9).



Fig. 8. Prof. Marinčić provided unselfish support to the establishment of TELSISKS Conference (Opening Ceremony of TELSISKS ,1997)



Fig. 9. Prof. Marinčić and Prof. Milovanović with prominent world-renowned scientists in the field of telecommunications at TELSISKS (Prof. Tatsuo Itoh and prof. Ke Wu, from left to right)

He had been the permanent member of the editorial board of Microwave Review since its founding in 1992. In 2003 a special issue of Microwave Review in his honor was published and edited by Prof. Milovanović and Prof. Vera Marković. His colleagues from around world, world-renowned scientist, wrote articles about their cooperation and research [4-6]. He made a distinguish contribution during editing of special Microwave Review issue in 2001 (guest editor: Prof. Bratislav Milovanović), which was dedicated to Nikola Tesla and contained numerous original scientific results of prominent researchers from abroad [4, 7]. Prof. Marinčić didn't miss the opportunities to emphasise the significance of these published articles which elucidate many of Tesla's inventions in the last decades.

Prof. Marinčić was editor-in-chief of the journal Electrical Engineering from 1980 till 1985. He was also a President of the Program Committee of Telecommunication Forum (TELFOR) and a long-term member of editorial board of International Journal of Numerical Modelling (Willey). He took part in important Serbian scientific societies: a member of Engineering Academy, a president of the Society for Microwave technique, technologies and systems, a chairman of the IEEE MTT-S National Chapter, a director of the Gallery of Science and Technology.

IX. AWARDS FOR HIS SCIENTIFIC WORK

Academician Marinčić received many prestigious awards for achievements in the field of education, research and science, and in general for the society development. He was and will always be a role model for the young. His most important awards are:

- Acknowledgements (JAZU),
- Award for contribution to the development of ETRAN
- Association of Engineers and Technicians of Yugoslavia award for his contribution to the journal "Tehnika"
- Award for outstanding contribution to the development of of the Faculty of Electronics in Niš
- Society of Telecommunications and TELFOR Acknowledgements for contribution to the development of telecommunications and microwaves (2007)
- Gold Medal and "Raum und Zeit" Journal Award
- National Association MTTs Award for Lifetime Achievement
- International Association for microwave technique Recognition Award: London (2001), Milan (2002), Munich (2003) and Amsterdam (2004)
- Association of Professors and Scientists of Universities in Serbia Award
- Middle East Technical University Special Plaque
- Nikola Tesla Society Serbia Plaque (2011)

He received following awards for his scientific papers: Annual Radio Television Belgrade Award, 2 awards for the best paper at ETRAN Conferences, award for the best paper in

Journal "Elektrotehnika" and "Nikola Tesla Award for scientific achievements in technical science".

X. "ALEKSANDAR MARINČIĆ" AWARD

Prof. Marinčić contribution to the development of telecommunications and electrical engineering in general, and the reputation of our scientists in the world is tremendous. The academic community and people who appreciated Prof. Marinčić are aware of irreparable loss and emptiness that the death of this academician has left. However, his life and work is an encouragement for young researchers to follow his way. Having this in mind, the Assembly of MTTs Association made a decision during ETRAN 2012 Conference to establish annual "Aleksandar Marinčić" Award for the best scientific paper in the previous year. This award should be an incentive to researchers in field of telecommunications, primarily in scientific fields that MTTs Association encloses (Fig.10).



Fig. 10. Prof. Marinčić longed for in-depth theoretical and experimental knowledge of telecommunications

XI. CONCLUSIONS

All of us will remember this wonderful man, completely dedicated to science and higher education. He was always longing for knowledge in emerging technologies. He was curious and talented for experimental work. Prof. Marinčić always made efforts to share his in-depth knowledge with his students, colleagues and associates even during a long period of his struggle with the severe disease. He studied and presented with immense love and charisma the work of Nikola Tesla and Mihajlo Pupin to the world. He took part with tremendous strength in many professional societies and associations, as well in organisation of numerous conferences and scientific and technical exhibitions. His work represents immense contribution to the development of telecommunications and electrical engineering, the

popularisation of these disciplines among young people, the reputation of our scientist in the world and the development of society in general. His work is a beacon on a sharp cliff that separates knowledge from ignorance, and to all of us who loved, respected and appreciated the work of this wonderful man, lights the way for further scientific and technical work and encourages us to continue the prosperous vision of this scientific genius.

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