

## ESSAY - INTERVIEWS

### MOST ILLUSTRIOUS ALUMNI OF THE SCHOOL OF MEDICINE, UNIVERSITY OF ZAGREB, ZAGREB, CROATIA

Dear Readers,

In the issue 544=52-53 of our periodical, RAD HAZU – Medical Sciences, we introduced a new feature entitled *ESSAY – INTERVIEWS „Corresponding Members of Croatian Academy of Sciences and Arts, Department of Medical Sciences“*. For the issues 54-55; 56-57 and the present issues 58-59 of our journal we decided to expand the scope of that series and include interviews with other internationally known alumni of the School of Medicine, University of Zagreb, Zagreb, so that we could profile even those alumni who are not Corresponding Members of the Croatian Academy of Sciences and Arts. This change of venue required us to change also the title of this series of interviews, and rename it in Latin **Illustrissimi alumni Facultatis Medicae Zagrabiensis**. The same interviews, translated into Croatian will be published on the electronic web site of the Medical Faculty **mef.hr**.

**Dr. Ivan Damjanov**, Emeritus Professor of Pathology, The University of Kansas School of Medicine, Kansas City, USA, who is also a Corresponding Member of the Croatian Academy of Sciences and Arts agreed to continue conducting these interviews. Like the initial interviews those in the present volume are produced under the same Latin title in cooperation with the editors of “mef.hr”, the official website of the School of Medicine, University of Zagreb. The preface to the initial series of interviews is reprinted here for historical reasons and to show that the main goals and intentions for this series remain the same despite the changes of the title of the series. In the present issues 58-59 there is one exception because Ivan Damjanov-Interview was conducted by Marko Pećina.

*Marko Pećina*

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The preface in the Issue 544=52-53

The present series was conceived as a set of informally recorded conversations with the best-known and internationally recognized graduates of the School of Medicine, University of Zagreb. The English version of these interviews is now being published by HAZU to make them accessible to a wider readership, including all those who do not understand or read Croatian.

The primary goal of this series of dialogues in RAD HAZU is to present and recognize the outstanding alumni of the School of Medicine University of Zagreb, Zagreb, Croatia. We hope that our readers will enjoy reading about the memorable events in the lives of these physician-scientists, their achievements, and scientific contributions that made them famous worldwide.

The emphasis of these discourses will be on the human side of science and medicine. Our goal was to give the interviewees a chance to reminisce about their trials and tribulations as well the happiness and fun they experienced in their lives. In other words, the objective of the interviews is and will be to give our esteemed interlocutors an opportunity to tell their life story in their own words and show us “how they did it” while still keeping their personal and professional lives in balance.

Finally, it’s a good time to remind you, our readers, of the Latin saying “*verba volant scripta manent*”, which justifies publishing so many written words that otherwise would have been forgotten. By producing these pieces, our purpose was to preserve the informal records of the lives and work of featured physician-scientists; and by transforming their verbal testimonials into written documents, leave a permanent trace of their activities for future generations in the archives of HAZU.

*Marko Pećina  
Ivan Damjanov*

## Ivan Damjanov Interview



Ivan Damjanov, Emeritus Professor of Pathology, The University of Kansas School of Medicine, Kansas City, Kansas, USA. He received his MD and PhD degrees from the University of Zagreb, and honorary doctor degrees from the University of Novi Sad, Serbia and Charles University, Prague, Czech Republic. As a Diplomate of the American Board of Pathology he worked at several University Hospitals in the USA, and also taught at four Medical Schools, including University of Connecticut, Hahnemann Medical College and Thomas Jefferson University in Philadelphia, and University of Kansas. He is best known for his research in developmental biology, tumor markers immunohistochemistry and medical education. He is a corresponding member of the Croatian Academy of Sciences and Arts.

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1. Two years ago, when you and I started talking about these alumni interviews, you probably never thought that you will be asked to do one with me. But it is now your turn and I am glad that you consented to let me interview you.

You are right, this was not in our initial plan, but I must admit that I am pleased to comply and answer a few questions that you prepared for me (Figure 1).



*Figure 1. Interviewer Marko Pečina and the interviewee Ivan Damjanov, Zagreb, April 2022.*

2. Let me start with a question about your name. How did you get it?

I was born in 1941 in the Kingdom of Yugoslavia in a city called Subotica, which is now in the northern part of the Republic of Serbia. Five days after my birth, Hitler declared war on Yugoslavia and a few days thereafter the entire country fell apart into several smaller parts, some of which were annexed to the neighboring countries allied with Germany. My native town was occupied by Hungary. The Hungarian authorities had a list of officially approved i.e., permissible names. From that list my parents chose a name that was both Croatian and Hungarian. In Croatian the little Ivan is called Ivica, and my grandfather shortened it to Ica, or its vocative, Ico, and that's how my friends still call me. Upon my emigration to the US I became Ivan again. However, my name was pronounced now with an American twang and beginning with an "ay", unless I taught my interlocutors how to pronounce it correctly. My last name presented additional problems to anglophone people and I played with the idea of changing the "j" in my last name to a "y". However, my daughters objected, and we did not do

it. Americans like shortcuts and thus, for practical reasons, my residents shortened my last name and started calling me Dr. D ("Dee").

3. How did you come to Zagreb from your Subotica, the town of your birth?

A simple answer is by train, following the decree of my father. I grew up in a patriarchal family and my father had almost absolute authority to do whatever he wanted. He studied veterinary medicine in Zagreb in the 1930ies and in his mind that was the most cultured city in Yugoslavia. Thus, he decided that his son must get the best possible education and transferred me to Zagreb as soon as that becomes feasible. Soon after my eleventh birthday he managed to enroll me into the Classical high school in Zagreb, despite the protestations of my mother and grandmother. To appease them he bought a house in Zagreb and shipped me away together with my grandmother to join my uncle who was studying engineering there. I loved my high school and still like Latin, the language that we studied for 8 years with our beloved professor Marijan Bručić (Figure 2).



*Figure 2. Graduation party, Classical High School, Zagreb 1958. Ivan Damjanov is first from the right in the front row. Professor Marijan Bručić was the headroom teacher who led these students from their first grade till graduation. Several of the students on this photograph have achieved prominence in Croatia: Ana Karić, dark-haired woman to the left of the professor became a famous actress. Smiljko Sokol, the men with a moustache to the left of her became professor of law, and wrote, together with two other lawyers, the Constitution of the Republic of Croatia in the 1990ies. Krešimir Veselić, next to Damjanov, became a university professor of mathematics and a corresponding member of HAZU.*

#### 4. Do you feel that Zagreb is your real home?

I was already asked the same question in another interview in Spain and I answered it quoting Rudyard Kipling: “We’ve only one virginity to lose, and where we lost it there our hearts will be”. I lost my sexual and intellectual virginity in Zagreb, and thus I know for sure where my heart will be forever.

In Split, where we bought an apartment a few years ago and still spend a part of our retirement, they often ask me from which part of the “region” I came from. I tell them that I am from Zagreb. Even though I have spent more than 20 years in that town and still go there to vote and pay my taxes, I do not speak with a real Zagreb accent and do not use the local slang. My interlocutors would therefore usually ask me “Where are you really from?”. To cut the discussion short I would tell them that I

am actually an American from Kansas. Unfortunately, were I to speak English to Americans, they would immediately recognize that I have a non-American accent. For the hard-core nationalists, I am thus neither a good enough Croat nor an American. I must disappoint them, however, since I feel at home on both sides of the Atlantic and do not give a hoot about them nitpicking about my real nationality.

#### 5. What do you remember of your student days in Zagreb?

Optimism of the memory has wiped out from my mind the remembrances of all bad days. All that remain are recollections of the nice moments. I liked attending the lectures at the Medical School and I dutifully went to most of them, indiscriminately paying attention to most of my professors. I was an obsessive



note-taker, and regularly transcribed my notes into well organized notebooks. While paying attention to my professors I also tried to imitate them and I also tried to learn how to teach, how to explain complexities of biomedical sciences and, most importantly, how to ask questions, anticipating what could show up on the oral exams that we had at the end of each course.

Some of my professors stand out in my memories more than the others. For example, we were all awestruck by professor Drago Perović, the anatomist who drew in front of us on the blackboard intricate parts of the human body. Since I do not know how to draw, I was actually discouraged by his bravura performance, realizing that I could never visualize in my mind or draw with pen or pencil all those anatomic details like my professor. Little did I know then that I will spend my life in pathology, an epitome of a morphologic discipline.

During the first two years of my studies, I was most attracted to physiology. Soon after the course began I asked my professor Božović which English textbook of physiology should I buy. On his advice I bought the American translation of the textbook written in Spanish by the Argentinian Nobel Prize winner Bernardo Houssay. It was the first English medical textbook from which I studied in great detail. From it I learned the essential biomedical English terminology and even more importantly I learned how to study and write. I still consider the money spent on Houssay's book as one of the best investments of my life. And even today I still like medical books, maybe because I was at an early age imprinted by that physiology book.

The physiology lectures were those days given by only two professors, Ljubo Božović and Nikša Allegretti. I was mesmerized by both of them and after the final exam I applied to become a teaching assistant in physiology ("demonstrator", in Croatian). Professor Božović was a witty joker and his lectures were always entertaining. He also liked to talk informally with us the students. The topics of those informal discussions varied from one day to another and were not always politically correct in the communist society of those days. I still remember how he commented about a well-known clinician who catered to the highly ranked communist politicians, calling him *Incitatus*. To us who knew Roman history from our high school days the message was obvious: If the Roman emperor Caligula could promote his own horse *Incitatus* to the rank of a God, who would prevent the communist rulers to promote their personal physician to the rank of a full professor!?

Professor Allegretti was always serious and never smiled. We were always a bit afraid of him. Only later, when I started writing with him a manual for the student's physiology laboratory practicum, did I realize how good a person he was and how much he cared about teaching and medical students in general. Among other things, he and his Department have actually motivated several

of my upper-classmen, who were a few years older than I, to write student-generated mimeographed texts (known by us the students as "scripta"). Some of those students, such as Milivoj Boranić and Vlatko Silobrčić became later leading Croatian scientists. Personally, I learned from professor Allegretti many things. Above all I still remember him saying that, if you want to become a professor, it is not enough to know your subject; you must also care deeply about the students you are teaching.

During the third year of my university studies I was exposed for the first time to real medicine in two subjects: pathology and pathophysiology. Pathology was less than inspiring and was taught in a very pedestrian manner. Pathophysiology, on the other hand, was very exciting and we were almost all smitten by the presentations of professor Pavle Sokolić. Needless to say that I do not remember anything from his lectures. Still, if I were to close my eyes, I could see him vividly walking from one end of the lecture room to the other lecturing to us, as if he were a poet or a prophet. Only many years later, I became aware of a line from the Bible: *It is a fearful thing to fall into the hands of the living God* (Hebrews 10:30). But in any case, it was a memorable experience.

At that time there were no textbooks of pathophysiology. My colleague Vlatko Grnja, who became later a radiologist in the US, and I proposed therefore to professor Sokolić, that we will record his lectures on a tape recorder. Our goal was to play back the recorded lectures, decode his words and dictate them to a transcriptionist, who was hired to this end by the Medical School. We spent many days working on that project but, unfortunately, we never managed to complete the task and publish a textbook based on professor's lectures.

A special place in my medical school remembrances is reserved for professor Nikola Škreb. I spoke about him *in extenso* in my interview for the *International Journal of Developmental Biology* (<http://www.ijdb.edu.es/web/paper.php?doi=10.1387/ijdb.120255ja>); thus there is no need to repeat it here. It should suffice to say that he was my mentor, my idol, and protector. He introduced me to science. I owe him more than I could say here.

## 6. How did you get to America?

As a student I worked during my summer holidays as a tourist guide. During the school year I would also moonlight from time to time as a local guide whenever I was called by the tourist agency. One of those days, during my fourth year of medical studies, I had the chance to guide a group of American physicians from Hawaii. Talking to me in private, one of those physicians gave me his business card and suggested that I apply for future training to his hospital on that island. Upon his return to the US, he sent me application forms and all the necessary information on how to reach America and continue my education there. Following his suggestions, I and two of my close student friends



passed the American medical licensing examination, known as ECFMG, which enabled us to continue our education in the US. Three of us moved then in 1967 to Cleveland and I completed two years of my pathology training in the US.

Those days there was a war in Vietnam and I did not want to apply for a US immigrant visa.

After two years of America I returned to Zagreb where I still had a job waiting for me in the Department of Pathology of the Medical School. My wife's and my own parents were elated that we chose to return to Croatia in 1969.

#### 7. How was it when you returned for the first time from America?

I went to America two times and returned two times. The first few weeks after my first return to Croatia in 1969, I was in a horrible shock. I could not sleep, I had nightmares and I would wake up in the morning asking myself how I could have ever made such a stupid decision to come back.

Those days the pathology residency training in the US differed significantly from that in Croatia. In America, pathology residents were spending their entire day in the hospital interacting with other clinicians and trainees of other profile, doing aspiration cytology procedures, discussing medical problems and learning pathology in a clinical context. After two years of pathology training in the US I learned about 85% of all pathology I needed for my future practice, with the understanding that the rest I will continue learning on my own for the rest of my life. Instead of that I was told in Zagreb to forget about this "American nonsense" and to apply myself to mastering "my real trade", by which they meant autopsy dissection. Nobody was teaching me anything else and most of us residents were autodidacts learning microscopy and other skills on our own. Most importantly we had only limited access to real clinical material.

After the daily autopsy routine during the morning hours, we were typing our own reports. Needless to say, I became quite a typist, although I asked myself often if that's why I went to medical school. Our contact with clinical physicians treating living patients were minimal, since most hospital facilities were located at Rebro, 3 km away from our Institute of Pathology. I felt that I am stagnating and actually moving away from clinical practice. Instead of being trained to become a clinical pathologist I was supposed to become an autopsy attendant. It is worth mentioning that today in the US the performance of autopsies accounts for less than 5% of a pathologist's daily duties.

After a few months, I adjusted to the new situation and decided to make my own schedule. Accordingly, I would complete my autopsy duties in the morning, type quickly the autopsy report and then spend the rest of the day in the Department of biology

working with professor Škreb and my friend Davor Solter, who was an assistant in that Department.

It turned out that I had luck and made a good decision. American financial wizard Kevin Davis defined luck as something that "happens when preparation meets the opportunity". He also said that "you need to put yourself in a right position to have luck." My preparation included two years of pathology training in the US, during which I mastered the basic elements of diagnostic histopathology, started thinking like a pathologist, and learned some new laboratory techniques such as electron microscopy and histochemistry. I also learned how to write scientific papers, review published material and critically approach problems. The opportunity opened up by chance when Davor and I realized that we could produce malignant tumors from mouse embryos transplanted to extrauterine sites. Our discovery that we can produce malignant tumors called *teratocarcinomas* from normal embryos without exposure to chemical or physical carcinogens was published in the British journal *Nature* in 1970. At that moment I learned the real meaning of the word serendipity.

This paper marked the beginning of my scientific career. It was like an entrance ticket to an exclusive international club of leading embryologists and pathologists working on the borderland between pathology and embryology as defined by the leader of this endeavor Rupert Willis. It helped that professor Škreb became the president of the European Society of Developmental Biology. We suddenly had access to the most important meetings and were talking with movers and shakers of real science. We continued working hard and in four years published a dozen of papers in high impact journals indexed in SCI and Current Contents. I also remember how excited Davor and I were by a letter from the International Agency of Cancer Research in Lyon in which they invited us to write a chapter on mouse germ cell tumors for an Atlas of Laboratory Animal Tumors for the World Health Organisation (WHO). Jokingly, we referred to it as the "Micky Mouse Atlas", yet we were very proud: It seemed that our work began to be recognized by the "big guys" in the outside world.

It was not easy since we were working in a modestly equipped small lab. We had to do essentially everything ourselves, from supervising the mating of animals, isolating the embryos, mixing the chemicals to cutting the frozen sections, or developing the photographs, typing the manuscripts etc. Typing was a special challenge: Those days all major journals required from authors to submit each manuscript in triplicate and that meant typing with carbon paper copies and then correcting each typographical error or starting the page from scratch. But we were young and highly motivated, and nothing was too difficult. Each paper that was accepted for publication was a new stimulus to intensify our efforts. I remember copying into one of my note books the motto of US Marines unit Seabees: "The difficult we do at once; the impossible takes a little longer."

### 8. How did you finally decide to move to America?

It was not easy for me. I am an emotional person, I loved the country of my birth, and I sincerely believed that my scientific career will blossom one day in Zagreb. My mother Ana, and especially my mother-in-law Gela were constantly trying to persuade me and my wife to stay in Croatia. My mother even spent all her savings to build a summer home in Biograd on the Adriatic, where our children loved to vacation. And to be honest, since we had a house in Zagreb, living on two modest but adequate salaries, with a live in maid and grandma available on demand to take care of our children, the day to day life in Croatia was quite comfortable.

In my professional life I made nominally significant progress and earned the title of titular assistant professor (“naslovni docent”). Nevertheless, I had a haunting impression that my scientific work was not progressing fast enough. Worst of all, I was not able to establish my own laboratory in the Department of Pathology. Old time pathologists running the Department were in principle opposed to any animal or experimental research to be performed on their premises. I felt alienated and frustrated.

In the nineteen seventies the Vietnam war was slowly coming to an end, and also my family situation changed with my mother dying of lung cancer. Davor left for America, and I was unable to recruit any junior colleague to join me in the laboratory. Like my senior pathologists in the Department I was spending afternoons many days per week performing autopsies in smaller hospitals to earn some money. I even wrote articles for newspapers to earn a few dinars. I simply could not accept that “that was it” and finally decided to move to the US.

Once I made up my mind to leave Croatia I accepted an offer from the University of Connecticut in Farmington, CT and moved there in 1974. New life with a new beginning included working in the hospital, studying for the exams to obtain a medical license, and writing grants to obtain funds so that I could establish a research laboratory. Once I obtained the research funding, I realized that I could not handle the hospital responsibilities in parallel with research. Looking around for a more congenial place I finally moved to the Hahnemann Medical College in Philadelphia. My new boss, Dr. Emanuel Rubin (Figure 3) reduced drastically my clinical duties and gave me free reins allowing me to spend most of my time in the research laboratory.

My primary task was to secure good funding of the research operation and also organize the postgraduate doctoral studies in pathology for non-medical graduates. During the next 9 years that I stayed at Hahnemann our Department educated over 30 students who graduated with a master’s or doctoral degree in experimental pathology. I was the mentor to 15 PhD students

and supervised their theses (Figure 4). Most of these students got jobs in the pharmaceutical industry, but some of them became full time researcher or joined academia in another form. Some of them gave up on science and became medical doctors. Our Department rose to national prominence, and after 8 years at Hahnemann we were recruited to move to Jefferson Medical College in Philadelphia. During one week of June of 1986, under the leadership of Dr. Rubin, 52 of us moved to Jefferson Medical College, into modern laboratories that were renovated for our team. At that time I had 3 NIH research grants, several post-doctoral fellows and graduate students. I even brought 3 young doctors from Croatia to work in my laboratory (Figure 5).

At the same time I became involved in medical student teaching and wrote my first medical students textbook of pathology. I was also in charge of the education of pathology residents. I continued these educational activities throughout my professional life. Unfortunately, even though I have trained more than 200 young pathologists during my 50 years of hospital practice, not a single one of them became a fulltime scientist. Four of them became chairmen in their university departments. One of them even received the highest national award for teaching of pathology, and another one earned the title of the best college professor in the State of New Jersey.

### 9. Did you have enough time for science during your professional life?

Abraham Flexner, a great reformer of medical education in the US studied the American medical schools for several years during the first few years of the 20<sup>th</sup> century. In 1910 he published the results of his study. In this report he recommended the closure of most US medical schools that did not meet the standards which he defined for the US medical schools for the rest of the twentieth century. He also decreed that the teachers in those medical schools should meet certain criteria. According to Flexner, ideal academic physicians should all have a tripartite career: they should practice clinical medicine, work as scientists in the laboratory and at the same time act as teachers educating medical students and residents. As a young graduate I accepted Flexner’s recommendation and from my first days in America till 2018, when I retired, I endeavored to remain a Flexnerian tripartite academic physician.

I think that I was quite successful, although during these 50 years in academic pathology my emphasis changed somewhat from one aspect of my biomedical career to another. For the first 20 years my emphasis was on research and during that time my laboratory was constantly funded by grants from the National Institutes of Health, Bethesda, Maryland. In parallel with my research I was also practicing hospital medicine working in pathology laboratories of my universities and teaching in medical schools. In mid-eighties of the last century, I became more





*Figure 3. With Dr. Rubin, his chairman for 17 years.*



*Figure 4. At the graduation of one of the 15 PhD students whom he supervised and mentored.*



*Figure 5. Sitting in the right corner, surrounded by members of his research laboratory. Three young Croatian doctors are also present: Hrvoje Vrić and Božidar Horvat, who were working on their science doctorates (PhDs, to be defended upon their return to Croatia) and Zoran Gatalica, who had already had a DSc degree from Croatia.*



involved in teaching of medical students and my practice of pathology changed because I became more subspecialty oriented. Accordingly, I developed special expertise in the pathology of the gastrointestinal and urogenital tract, with focused interest in the pathology of male and female gonads and kidneys. During the last 20 years I have also devoted a lot of time to my educational activities and have published a number of pathology textbooks and ancillary texts for medical students and residents.

Analyzing my professional trajectory, I must admit that I have betrayed to some extent Dr. Flexner and his ideals. However, we all know that in today's medical practice and research, sub-specialization is the only way to survive and advance, and thus I realized that something had to give in. Furthermore, I am not sure that anybody could be still a true tripartite Flexnerian academic physician. I console myself saying that at least I tried, and in my mind, I followed his recommendations, as much as I could.

In spring of 2010, I attended an international meeting organized in Split by my friend Matko Marušić in honor of the 100 year's anniversary of Flexner's Report. It was refreshing to note that many of us still remained devoted to Flexner's ideals. Once Flexnerian, Flexnerian for the rest of one's life, even though all of us were cognizant that some of master's tenets needed to be changed and adapted to realities of medical practice in the twenty first century. .

#### 10. What is your most important contribution to science?

In response to this question I like to joke and say that my most important contribution was to introduce Davor Solter to Nikola Škreb, with whom we then published several notable papers (Figure 6). As you may read in the interview with Davor, thereafter he moved to America and became the most famous developmental biologists of our times and the best known offshoot of the Zagreb School of Developmental Biology founded by our beloved professor.

To answer your question , I eyeballed the list of my publications, reflected about them and then decided that my most important paper was the 1970 Nature publication in which three of us described how to produce embryo-derived teratocarcinomas. We published thereafter a series of articles about teratocarcinomas and embryo-derived tumors, such as the yolk sac tumor. However, as the musicians would say , those were only "variations on a theme". The research on teratocarcinomas exploded thereafter and several important meeting dealing with this problem were held, including the best know in Cold Spring Harbor attended by Francois Jacob the French Nobel prize winner. The real advances in the field were published by other groups of scientists who were better versed than us in laboratory techniques such as tissue culture, cell cloning and manipulation and growth embryos under controlled

conditions, isolation of appropriate growth factors and gene cloning. At the end it was the Englishman Martin Evans who received the Nobel prize ; the Nobel committee in Stockholm had to choose one member of that group that worked in this field. But for me, as another Nobel prize winner, Francis Crick said, "it was important to be there when the picture was painted". I am glad that my modest "brush strokes" contributed at least something to the final picture that we all had in our minds. The group picture of the last meeting of that "teratocarcinoma group", shown in Figure 7, was held early in the 21<sup>st</sup> century at the University of Bristol, UK, where Martin moved at the end of his career.

The momentous advances of immunohistochemistry in the nineteen-seventies attracted me and I became interested in producing and testing of monoclonal antibodies. Some of those antibodies that we tested with Davor Solter, his wife Barbara B. Knowles and Peter W. Andrews are still used today. I think that these collaborative studies made a significant impact in embryology as well as pathology. Thereafter, after the human embryonic stem cells (ESC) were discovered I was involved in further characterizing them. As predicted by our previous work on mice, we showed that the human ESC represent normal equivalents of malignant stem cells of teratocarcinomas, known by pathologists under the name of embryonal carcinoma. Unfortunately, we did not develop a system that would allow us to transform the benign ESC into malignant embryonal carcinoma cells, one of the several projects that I never completed.

For my scientific work and the teaching I received several awards, including the honorary doctorates from the university of Novi Sad and the Charles University in Prague, Czech Republic (Figure 8). I am also a corresponding member of the Croatian Academy of Arts and Sciences and the Vojvodina Academy of Arts and Sciences.

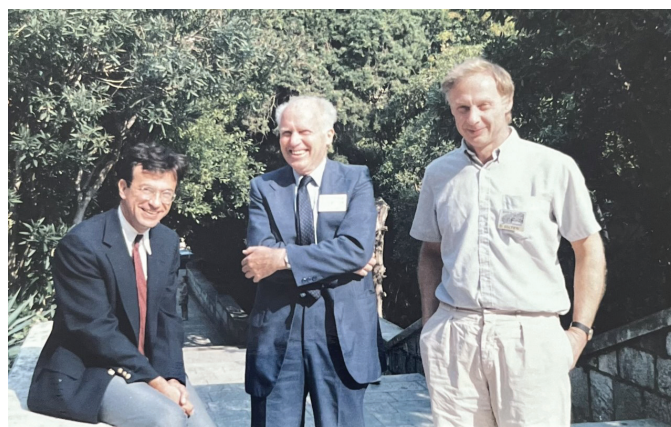


Figure 6. With Davor Solter standing next to professor Nikola Škreb whom we honored by organizing an international meeting in Dubrovnik.



*Figure 7. Last teratocarcinoma meeting held in Bristol, UK. Standing behind Barbara B. Knowles, who is in the front row. Martin Evans, the Nobel Prize winner, is standing first from the left in the first row. Davor Solter is in the last row in the middle. Peter W. Andrews of Sheffield, UK, the organizer of the meeting, is standing in the third row to the right.*



*Figure 8. Honorary doctor degree ceremony at the Charles University in Prague including the photograph with the official promotor, Dr. Alena Skalová*



**11. You worked as a hospital pathologist most of your life .Tell us something about this aspect of your professional life.**

Pathology is considered to be a basic medical discipline but it is also a clinical specialty. Traditionally it is considered to be the basis of clinical medicine. William Osler, one of the four legendary founders of the most prestigious American medical center, The Johns Hopkins University School of Medicine in Baltimore, Maryland, spent his working days in the clinics, and yet found time to personally perform autopsies on the bodies of his dead patients. His famous dictum was: "The way is our pathology, thus is our medicine". I still believe that Osler was right.

Pathology as a science and a clinical discipline has unfortunately been lagging behind other medical specialties for a good part of the 20<sup>th</sup> century. Then a few major events took place and revolutionized the the practice of diagnostic histopathology. The first one of those events was marked by the introduction of monoclonal antibodies into the daily practice of pathology. The second revolution took place during the early days of 21<sup>st</sup> century when pathologists began using the techniques of modern molecular biology to study and analyze the clinical specimens. I was lucky enough to participate in both of these revolutions.

My contributions related mostly to the first revolution as reflected in some 100 papers dealing with immunohistochemistry. Most of these papers I would classify as applied science, but I think that I still contributed to the better understanding of several human disease, most notably some tumors of the urogenital tract. I also lent my expertise to my clinical colleagues with whom I collaborated in elucidating the pathological basis of some important diseases such as diabetic gastropathy or some newly discovered tumor variants. My experimental work on mice helped me understand better some human tumors.

My experience and knowledge I tried to transmit to my residents and students, and for those efforts I received quite a few awards from both groups. Teaching was an integral part of my medical practice, and I used to say that you cannot practice medicine without teaching. I enjoyed it since by teaching others I also learned many new things. The Latin apothegm , "discendo discimus" (by teaching we learn) assured me that I should continue along that pathway. The vicarious pleasure which I experienced when a student of mine would surpass me to become better pathologist than I ever was , cannot be described. I always repeated to myself, as well to others the adage of Leonardo da Vinci who said that "poor is the the pupil who does not surpass his master".

**12. How many papers did you publish?**

I do not know the exact number, since I stopped counting them many years ago. Index Medicus lists under my name more than

330 papers, but not all of them would should be considered as scientific. Furthermore, I wrote quite a few book chapters, gave several interviews or wrote opinion papers for newspapers and magazines, participated in discussions and wrote polemics.

From 1988 to 2003 I was the editor for book reviews for the journal *Modern Pathology*, the official journal of the US-Canadian Academy of Pathology. For that journal I wrote more than 150 book reviews, which I do not list among my publications or in my CV . Thereafter I worked 10 years as the Editor for pathology books for Doody Publishing, an on line medical book review service, and published electronically another slew of book reviews. All this I did because I love books and also because I thought that my write-ups will help others, including the writers of those books, and promote pathology books in general. I am not sure that I succeeded, but my writing contributed to my "name recognition" among the pathologists. As the saying goes, if it not fun, it is not worth doing, and I enjoyed doing it.

**13. How many citations did your papers receive?**

Professional biometricians claim that counting citations could provide a better way to quantitatively evaluate a scientist's overall output than by counting the number of his/her publications. I am very skeptical about either one of these two approaches , but unfortunately people often assign more faith to the numbers than written evaluations of a scientist's opus. Numbers are supposed to be more objective, or at least people believe them more than descriptive evaluations. People quote Lord Kelvin who said something to the effect that "if it cannot be measured it is not science".

Anybody who sat on academic committees charged with evaluating scientists knows that it is much simpler to count the papers and citation, rather than read the published papers themselves. On the other hand, maybe we should ask ourselves what do all those numbers mean and how objective they actually are. And of course we should ask ourselves what for are we using these numerical data. For comparison with others? As proof of somebody's academic value or productivity? For compiling lists of the best and most cited Croatian scientists? Or to boast in front of your friendly journalists who will use the data as sacrosanct, supposedly irrefutable evidence that you are a prominent scientist?

According to Google Scholar my papers were cited more than 17 700 times. Data of this kind helped me a few years ago to get listed in a Croatian weekly magazine as one of the most cited Croatian scientist. But let's not be too serious about this .Please allow me therefore to give you a few examples and thus illustrate how unreliable these "objective numbers" may be and how easy it is to manipulate them.



Example 1. If you analyze my own data on Google Scholar you will see that my citation score has been improved lately by quite a number of citations of the Croatian medical school textbook of pathology, on which I am listed as the first of the four editors. Medical students apparently cited this textbook in their graduation thesis and that bumped up my citation score. Student papers that were not published in a peer reviewed journal contributing to my citation score!? Obviously not a very scientific approach to increasing your citation score. Still, I am glad that my textbook was put to good use by all those students who quoted me and this helped them graduate.

Example 2. My most often cited paper was published in *Nature*. Impressive, since this is a high impact biomedical journal. For this paper I analyzed by electron microscopy two liver cancer derived cell lines, still widely used in the laboratories. However, the reviewers and the editors of *Nature* decided that my EM pictures were not important and they were thus never published. According to my estimate, my contribution to this paper accounted for less than 1% of the total message. Still, it is worth mentioning that this paper was cited more than 1600 times. Papers that are cited more than 600 times are considered by Science Citation Institute as classics; accordingly, I could brag that I have a "citation classic paper". I am a bit sheepish about this "honor", and mention it only in discussions about the absurdity of "citation fame". As my former chief used to say: "With this data and 3 dollars in your pocket you could get a ticket for the New York subway".

Example 3. My second most cited paper contains my real contribution. In this paper we reported some truly important data about human embryonic stem cells. However, if you scan the list of authors of this paper, you will see that it comprises some 60 names, listed alphabetically to avoid quarrels among the coauthors. Did I contribute 1/60 of the total message or a little bit more? Hard to say, but for all practical reasons answers to such a question are probably not too important. Even the so called objective numbers have their limitations, if you want to accept them. Or ignore them, as we most often do.

At the end, let me also say that I am not completely innocent in this citation game. From 1982 till 1994 I was the Associate Editor of the pathology journal called *Laboratory Investigation* (LI). Dr. Emanuel Rubin, Chairman of my department was the Editor in chief which meant that I was the main "work horse" in the editorial office.

LI was the official journal of the United States-Canadian Academy of Pathology (USCAP), and all the members had to subscribe to it. Most of them were practicing pathologists not interested in basic science papers published in that journal. As such, they were constantly protesting obligatory subscription fees that they had to pay for this journal, which they did not read at all.

In an effort to quell the rebellion of USCAP members against the journal, Dr. Rubin and I introduced into every of the 12 monthly issues a review article and an editorial about one of the research papers in that issue. The membership responded favorably to these new feature, but still complained.

At that time SCI started publishing the impact factor scores of the 6000 indexed journals, included then in their data base. We thought that a good ranking of LI on that list would impress and placate the discontents haranguing against us.. The data from SCI were very encouraging; only 2 years since we began editing LI, its impact factor rose to 4.927, which in those days was enough to rank LI as 93<sup>rd</sup> on the SCI master list of all journals. For the year 1985 our impact factor rose to 6.338 and we were ranked number 1 on the list of all 40 pathology journals in the SCI data base. Most of these citations were linked to the review articles, but that was not important since our ploy to increase the visibility and the impact factor of LI obviously worked. I should nevertheless, add that these impressive citation data did not placate the discontents. Their protests against LI worked and the leaders of USCAP gave in and decided to publish yet another more clinically oriented journal, *Modern Pathology*. I participated in editing and I am pleased to report that it is now one of the leading pathology journals.

#### 14. What is your h-index?

During the last 10 to 15 years h-index became one of the most popular parameters for promoting academic physicians as well as basic scientist at many universities worldwide. This h-index, named after Jorge Hirsch a physicist who invented it in 2005, is regularly calculated by SCI and usually listed in Google Scholar next to each scholar's personal data. According to published data, the h-index for Assistant Professors at most US Universities is 2-5 , for Associate Professors 6-10, full professors 12-24. For members of the National Academy of Sciences the average h-index is around 60, and for the Nobel Prize winners around 70. My h-index, if anybody wants to know, is 58. For those who do not know much about h-index, let me say that means that 58 of my papers have been cited 58 times or more often. It is also worth mentioning that 40% of all biomedical papers are never cited. Hirsch reckons that a h-index over 40 deserves to be considered as excellent and if over 60 exceptionally impressive.

Looking at my statistics it seems that I am OK. The greatest compliment I got from a scientist friend of mine who was impressed but also surprised with my h-index. When I asked him why was he surprised he told me that it is a very high score for somebody who is "not a real scientist". This was a left-handed compliment but it regaled me since it was in keeping with my basic philosophy condensed into a single sentence by the famous ballerina Margot Fonteyn who said: "Take your work seriously but never yourself".

**15. For some time you were quite preoccupied with medical student teaching. How come?**

Yes, with an emphasis on “quite”, especially during the 8 years that I was at Jefferson Medical College in Philadelphia. I still think that my collaborators and I produced some important data about teaching, or at least that our data were widely read and were considered by our peers to be interesting. For the projects that I designed with my collaborators I formulated a working hypothesis, designed the appropriate methodology, studied the variables, and tested the reproducibility of the results. Following the advice of Thomas S. Kuhn, an American philosopher and historian of science, we finally tried to see if we could “falsify our data”.

To give you an example, let me describe the study designed in collaboration with my colleagues the educational psychologists from the Department of medical education at Jefferson. We wanted to find out if the grades in my pathology course could predict the subsequent performance of these medical students in clinical subjects. To this end we tested the entire class of medical students and classified them according to their psychosocial characteristics, which were graded according to the standard criteria of educational and social psychology. Then we followed them while they were studying pathology and clinical subjects. We found out that students’ psychosocial scores were as good predictors of their success in clinical subjects as the pathology grade. However, when we combined the pathology grades and psychosocial scores, the predictive value of such combined data was even more significant. That study was reproduced in several other medical schools and has stimulated more research as well innovative modifications of our approach. It was cited more than 100 times by medical educator from various countries.

For my efforts to improve medical education I received quite a few commendations not only from my peers but also from my Kansas medical students who gave me consecutively 12 yearly awards for excellence in teaching. US pathology educators forming the *Group for Research in Pathology Education-GRPE* gave me their most coveted *Tom Kent award*. I travelled around the world lecturing about our approach to teaching, but also took that opportunity to illustrate many problems and failures that we have encountered during all these years. I also organized a 6 week remedial course for students with academic problems and taught this nationally recognized course every summer for almost 30 years. It was attended by students from many other US medical schools. I think that it served its purpose since almost all of my students who completed that course also passed the national USMLE examination.

I have written several textbooks of pathology for medical students. The most popular was the book of questions and short answers, which was ideal for students preparing for oral or essay

type written examinations, called *Secrets of Pathology*. I also prepared books for postgraduate pathology trainees and Board-certified pathologist preparing for recertification of their specialty diploma. Among these books the best seller was a book on cytopathology which I wrote together with my former resident Dr. Fang Fan, a phenomenally talented cytopathologist. Recently, she told me that our book was ranked as the third most popular pathology book on the American Amazon site.

My book that has managed to survive the longest on the market is a book for students of stomatology, veterinary medicine, pharmacy and related disciplines, called *Pathology for Health Professions* which was first published in 1995 and has had since then 5 additional editions, with total sales of over 100,000 copies. Recently, I recruited my protegee Anamarija Morović Perry, Associate Professor at the University of Michigan, Ann Arbor, Michigan, and her husband Kyle Perry, who is a pathologist at Henry Ford Hospital, Detroit, Michigan to help me prepare the 6<sup>th</sup> edition of that book (Figure 9). In that context allow me to cite the French writer André Gide: “Le problème, n’est pas common reussir mais comment durer” (The problem is not how to succeed but how to last). I never thought that my book will remain in print for 27 years.

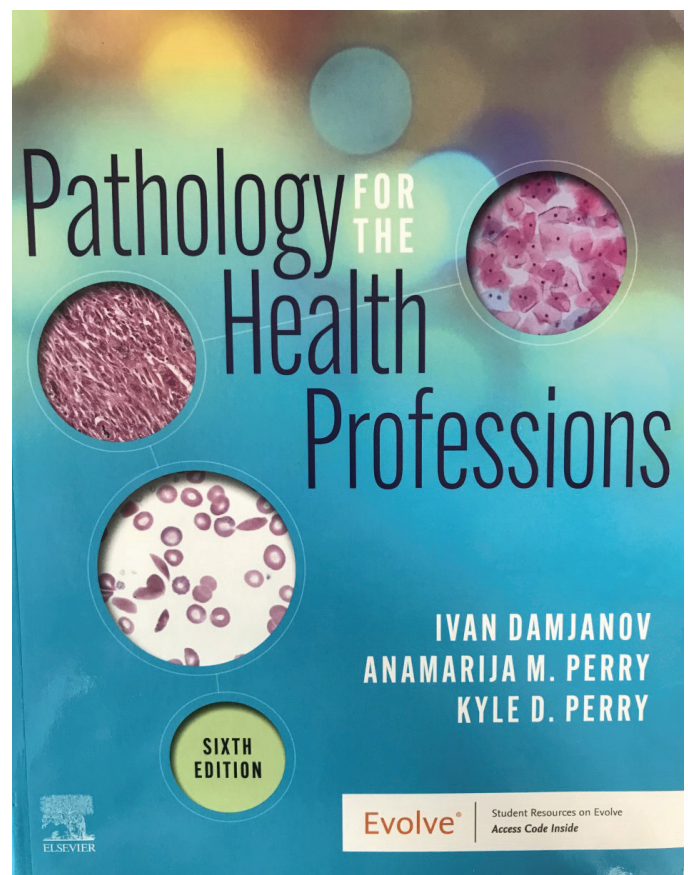


Figure 9. Pathology for Health Profession, Elsevier, 6<sup>th</sup> edition, 2022.

**16. You did quite a bit for your alma mater, The Medical Faculty of the University of Zagreb. What should we mention here?**

First of all I would like to mention my efforts to improve the teaching of pathology. It all began in the nineteen eighties when I suggested to my colleagues in Zagreb that we should translate into Croatian the leading American textbook *Robbins Pathologic Basis of Disease*. The American publisher asked \$10 000 for the translation rights and the so called “mechanicals” required for the printing of the Croatian version. Those days there was a financial crisis in former Yugoslavia and the foreign currency for this translation was not readily available. I offered to raise voluntary contributions from Croatian physicians working in the US . Unfortunately, I managed to raise only \$5,000 and thus had to pay the rest from my own pocket. In retrospect I think that it was money well spent and this translation became the standard textbook of pathology throughout Yugoslavia. It remained in use for more than 15 years, i.e., even after that state fell apart.

My second contribution to my *alma mater* was realized after 1995 when I persuaded my pathology colleagues professors Dr. Stanko Jukić i Dr. Mara Dominis to help me apply for financial support from the Hungarian-American philanthropist George Soros. Our application in which we asked for funds to introduce computer based teaching of pathology in Zagreb was favorably reviewed and Soros’ foundation *Open Society* gave us a grant of \$50,000 to accomplish that task. With that money we bought two dozens or so table top computers and paid for the translation and installation of the pathology teaching program which I developed with my team at the University of Kansas. I think that this was a very important first step toward reforming the teaching of pathology in Croatia.

Another contribution to the teaching of pathology in Croatia for which I take partial credit can be traced to the first years of the 21<sup>st</sup> century. Following on several discussions with my friend professor Jukić, who at that time was the Chairman of the Department of Pathology in Zagreb, I lead the joint effort to produce a modern Croatian textbook of pathology on our own. We wrote first a volume of general pathology, followed by a volume devoted to systemic pathology. Thereafter, with the input of pathologists from all other Croatian medical schools (Split, Rijeka and Osijek), in 2003 we expanded both of these booklets and bound them together into a single 850 page textbook (Figure 10) . I provided most of macroscopic and microscopic photographs and wrote quite a bit of the entire text, serving as its lead editor for almost 20 years. We also enlisted the help of several medical students skilled at electronic drawing on the computer and they produced many of the conceptual drawings, diagrams and algorithms. To recognize the first student who produced most of the drawings I paid for his airplane ticket to Kansas City, where he and his girlfriend stayed as our guests for a month.

The Croatian textbook of pathology is a technical masterpiece , a beautifully produced book for which I give full credit to Ms. Anđa Raič, the Editor and Director of the publishing house *Medicinska naklada*, Zagreb. Even though she is not a medical doctor, I think that she has contributed more to contemporary medical education in Croatia than anybody else. The fact that she has published more than 1,000 books over the last 40 years speaks for itself. I am sure that without her input we would have never completed our task and Croatia would have never had an original, modern textbook of pathology.

In this context I also must acknowledge the contribution of my good friend and co-worker professor Dr. Marin Nola (Figure 11). Marin helped me write many parts of that book and was absolutely irreplaceable in editing the final text. He spent several month in my house in Kansas working with me on the final text , filling the gaps, removing non-essential parts and selecting the figures. He and I prepared also the manual to help students study the main textbook and also prepare for oral and written examinations. Unfortunately, Marin died the day he delivered the manuscript of that manual to the publisher and thus never saw in print the final product of our 2 year-long effort. I should also add that the Croatian textbook and the manual were then translated into Serbian by professor Živka Eri and her collaborators in Novi Sad, Serbia.

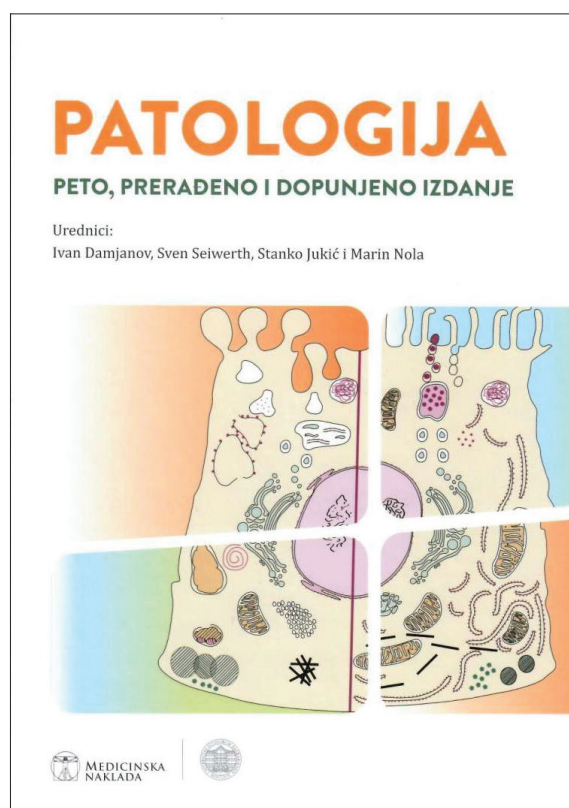


Figure 10. *Patologija*, Medicinska naklada, Zagreb, 5th edition, 2017.





Figure 11. With professors Stanko Jukić and Marin Nola at the presentation of a book that they wrote together.

**17. You have already entered into the ninth decade of your life. What now?**

Although I am an atheist allow me to cite here the Croatian folk proverb which says that men have dreams but it is up to God to make the final decision. Even though it is impossible for me to predict my future, I also know that I cannot sit quietly in place and do nothing. Just to keep my neural synapses in good repair, or, as I like to say jokingly “to stave off Alzheimer”.

Nevertheless, I gave up many of my previous activities and responsibilities. Thus, I do not work anymore in a diagnostic laboratory and have no hospital affiliation. Likewise I gave up working on the next edition of my favorite book, the Croatian textbook of pathology, which will now be curated for by my junior colleagues in Zagreb. All the illustration from previous editions I have donated to *Medicinska naklada* to assure that the book remains anchored to that preeminent Croatian medical publisher.

This year I have completed a book with my Indian colleague Dr. Harsh Mohan. This book called *Pathology Simplified*, is based on the Socratic method of teaching, comprising questions and answers. It is specifically aimed at more than 50,000 Indian medical graduates taking the qualifying exam that will allow them to pursue specialization, rather than to stay in family practice for life. On that exam, pathology accounts for 20-25 percent of the entire material and we felt that our book would help these young doctors revisit medical school pathology, which many of them have already forgotten since they studied it in early stages of their medical education.

With my Dutch friend Fred Bosman, another retired pathologist, I took upon myself to edit a well-established periodical *Recent Advances in Histopathology*. This should keep me busy and provide motivation to keep *au courant* with medical literature

and nudge me to follow the new developments in the field of clinical pathology for some time. In Croatia I am completing the revision of my textbook of pathology for nursing students and medical technicians. Occasionally I also contribute short pieces and interviews to *The Pathologist*, a UK/US magazine, for which I serve as a scientific consultant. I hope that these assignments will keep my brain from accumulating too much amyloid and shrinking in size too fast.

At the end, I would like to take this opportunity to mention my latest pet project. In brief, I have donated some money from my savings to establish a fund at the University of Kansas that will finance the exchange of medical students between Kansas and Croatia. My fund was designed to cover the travel expenses and defray the costs for room and board of these students. This year 5 Croatian students will spend a month in Kansas (Figure 12). Next year several American students from Kansas will travel to Croatia. My goal is to bring them all together and thus show them that the human nature is the same here and there on both sides of the Atlantic; and that the similarities between people from distant places are much more striking than the perceived differences. It is my way of building imaginary transnational bridges, and playing the role of a *pontifex* (Latin for “builder of bridges”).



Figure 12. With five Croatian students who will travel to America and work at the University of Kansas for a month.



## Ivana Rosenzweig Interview



Ivana Rosenzweig, consultant at King's College London, UK received her MD degree from the University of Zagreb, and her PhD from Trinity College, University of Cambridge, UK. She is a Fellow of the Royal College of Psychiatrists, London, UK and the founder of the Sleep and Brain Plasticity Centre at King's College, where she is currently exploring the role of sleep on brain plasticity and cognition, both in clinical and preclinical studies, with a particular focus on the sleep oscillations.

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1. You grew up in a family of medical doctors and one of your idols was your grandfather Filip. Did this medical family environment influence you during your formative teenage years and did it help you choose neurosciences as a career?

The short answer is that my *nono*, my grandfather Filip, in a way decided this for me. A slightly longer explanation is that I was fortunate, perhaps due to my father's combative nature and penchant for going against the grain, that the most coveted surgical positions in Zagreb were out of his reach. Thus, my parents settled in Sisak, and this beautiful historical city surrounded by three rivers provided me with the best possible schooling and education that one could wish for. This is something I would, sadly, only realize decades later.

Looking back, my parents' profession (and that of many other relatives who were all also doctors) obviously must have affected my life choices and trajectory. Medicine, medical terms, even the medical way of thinking were for me all *terra familiaris*. My parents had a (sometimes annoying) habit of discussing their cases *ad libitum* during our family meals or family trips. They were both doctors caring for their patients; phone calls and visits from their patients to our family home would easily extend into the evenings, and not infrequently later into the nights. I owe to my parents, especially to my mother, my passion for learning, sometimes just for the sake of learning.

However, my parents also fervently believed that children should be treated as background noise – or if possible, as a background whisper. Against that background, my sister and I instinctively built a separate universe parallel to that of our parents. In many ways we shared with them only the physical constraints of our small flat in Sisak (Figure 1).



*Figure 1. Me and my middle sister Ana. We fought a lot but we also followed each other around the world, and we still prefer to live within 5 minutes of walking distance one from another.*



When my youngest sister, who was then about two years old, started struggling with various infections, metabolic upsets and a strange neurodevelopmental regression – and eventually stopped walking and talking, that small flat became even smaller. My parents contacted anyone and everyone around to try and help her, but despite all the efforts, even the very best paediatric colleagues of my mother failed to fully fathom and categorize what was happening. I presume this was one of the first domino pieces which folded in my mind, albeit in a very slow motion - that, with better knowledge and understanding of the brain and how it works, it might have been possible to do more to help my sister, and other children like her. She is now an adult, but still dependent on my parents for even the most basic self-care. Those were difficult years and my grandparents, whilst living miles away in Split, provided all the unconditional love and moral structure that I needed and craved for. My grandfather came from a very old and politically active family. His cousins and uncles were amongst founders of the football team Hajduk; his brothers were amongst the founders of the Croatian Communist party; they formed and led the first Split's Partisan battalion during the Second World War; they were celebrated as war heroes; some of them died in concentration camps; some of them had schools in Split named after them. Some of them who survived were later imprisoned on Goli Otok, and served the sentence there for their views. And yet, my nono, despite all this revolutionary background also happened to be the most calm, peaceful, and understanding person on this planet. During one of my visits to my grandparents in Split, my nono and I spoke for hours about my youngest sister. At some point, he looked at me and said: It is up to you Ivana, to learn about the brain. And thus I followed his advice.

2. In preparation for this interview I read the one you gave two years ago (<https://korona.net.hr/pozitivne-vijesti/hrvatska-neuroznanstvenica-istrazuje-spavanje-u-mikrogravitaciji-dugotrajna-putovanja-u-svemir-morat-ce-ukljucivati-neku-vrstu-hibernacije/>) They wrote that you are a neuroscientist. How would you define that term? If I wanted to become a neuroscientist what would I have to do? Describe a prototypical neuroscientist and then tell us how did you become one.

I do not think I can authoritatively answer that question. I would say there is no strict format, but most if not all neuroscientists share the passion for understanding better the inner workings of the brain. If you insist, my abridged and doctored

version of the Wikipedia page would state something along the lines that neuroscience requires a multidisciplinary approach and that it includes all specialists with distinct knowledge of the brain's physiology, biochemistry, psychology, anatomy and molecular biology of neurons, neural circuits, and glial cells and their behavioural, biological, and psychological aspect in health and disease.

3. How much exposure to neurosciences did you have during your medical school years?

Again, as with my pre-University education, I was very fortunate to study at the Medical School in Zagreb. And in parallel to my early years, when I resented the parochial settings of my childhood, I only got to fully appreciate the extent of what I had when I began teaching as a fellow at Cambridge, and even more now as an academic at the King's College London. Simply put, I genuinely believe that our grounding in preclinical subjects was second to none in Europe and most likely in the entire world.

Here I have to mention two impressive men called Ivica who influenced me enormously and helped formulate my own concept of neuroscience, i.e., what it is and what it should be. The first one was Professor *Ivica Kostović*, whom, to this day, I regard in many ways as my major mentor (Figure 2). The second one who is not so well known in Croatia, was Professor *Ivica Kračun* who tragically died prematurely a few years ago (Figure 3). Like Kostović, Kračun was close to a genius, gregarious, generous, dangerous, and often quite moody. I believe that he was originally from Hrvatsko Zagorje, however, to us, he was like a Dalmatian 'Bura' storm, bigger than life, even though quite of a short physical stature in real life. If one had to present a musical sketch of the emotions his lectures would evoke, the best approximation would be by mixing music of Wagner and Stravinsky, with sprinkling of scientific philosophy and history, only for lessons to abruptly end in a tempestuous finale of Bach's Well-Tempered Clavier. My discussions about neuroscience with him were always inspirational, uplifting and quite memorable.

4. Did you have any role models or idols that you wanted to emulate? Premedical school, medical school or thereafter?

Yes and no. I always adored *Rita Levi-Montalcini*, and in many ways, she might be the one I get to mention most often. I liked that she dared to be a different neuroscientist in the world where women were, and still are, regarded as unequal members of the society.



*Figure 2. Ivica Kostović, my mentor and a great surrogate father to many of us.*



*Figure 3. Ivan Kračun with his collaborators in the Metabolic laboratory of the Clinical Hospital Center Zagreb, 1987. Standing next to him are Ksenija Fumić, Marija Heffer and Gordana Kračun.*



**5. Do you still have memories of events from your student days that helped you decide about your future?**

Those were difficult war and post-war years, and, to be frank, for most of my adult life I worked hard to erase some of those memories. Many of our colleagues were in a full or partial refugee status, the random bombings and shelling were continuing, and many of us had relatives who were engaged in active combat. The schisis of pretending that life goes on, and attending lectures, taking exams, whilst listening on news about Vukovar or Zadar, Petrinja, was not healthy and I am sure it took a significant toll on all of my colleagues, as well as myself. In many ways, even those not in the direct line of fire, were robbed of their youth, our brains were still developing and the epigenetic impact that those years must have left, have never been properly accounted for. We were not talking about it, and we never really talked about it even later.

When the war in Ukraine started, I called my Ukrainian friend to offer my support. However, after a few words I had to put the receiver down as I could not speak any more. This lasted for an hour, and then I started crying uncontrollably. I can not even say why, I don't think I am an overly emotional type, I just felt that something buried deep in me, something I ignored and actively worked on repressing from those years, was suddenly become unhinged in my mind.

**6. Did you practice medicine upon completion of your university studies or you decided to devote yourself to science exclusively?**

I did not practice medicine after graduation. I wanted to do science, pure science and nothing but science. Only after I did my PhD did I realise that, in order to know which questions to ask, I must spend some time in clinical practice. There was no other substitute for learning how to properly observe my patients and understand their problems. Like *Musil's Man Without Qualities*, I meandered never satisfied of knowing or being good enough, from doing science to clinically training in psychiatry, then neurology, then neuroradiology and eventually training in sleep medicine. I have eventually completed the full circle, from research to practice and back. Currently I am spending 50% of my time as a clinician (i.e., a sleep physician) and the other 50% as an academic neuroscientist. As my husband rightly stated it: 'If allowed, you would continue to study until your very end.' Don't tell him, but this is exactly what I intend to do.

**7. Why did you go to Cambridge for your PhD? Why Cambridge and not some other place?**

I do not believe in a 'predetermined' universe, and yet, looking back, I believe my path could have only lead to Cambridge. Firstly, my nono Filip often spoke about Cambridge as a centre

of educational excellence, and apart from his politics, I never challenged my grandfather's grand truths. Secondly, I never wanted to live in the USA, which was my husband's (then my boyfriend) first choice. Thirdly, after the war, I realised that my traumatised inner *homo politicus* needed to be in country whose people were politically frigid (or at least I perceived them to be so), and whose politics and inner workings would not interest me in the slightest, and thus, my second favourite choice, Israel, was also eventually out of the bounds.

But our personal history was sealed by our 1995 summer trip to the UK. The basic idea was to persuade my boyfriend that there were other places we could go together to study apart from the US. In those days before mobile telephones and internet, we spent four weeks in a cheap little University hostel in south London, pretty much without any contact with our families, or news from Croatia. We loved it though, we lived very frugally, rationing ourselves to a sandwich a day, and travelling for hours on the double decker buses around London whilst visiting various Universities trying to gather more information about scholarships and courses, and pretty much unaware of happenings at home.

To this day I remember the very feeling of profound happiness that overtook us both when we passed the newspaper stand one evening. This sported big headline stating that 'Oluja' started and that Knin was ours. I fear that passer-by's must have judged us to be on drugs, as I have never since done so much jumping, shouting and crying. An overwhelming sense of primordial joy and calm overtook us - the war which claimed and tainted our best years of youth was finally and truly over. Our homeland was free, we were free.

Years later I would read *Amos Oz's 'A Tale of Love and Darkness'*, and in the passage where the author describes the highly charged emotional scene and his father's reaction to the news that Israel has gained its statehood – that was the exact emotion I recognised.

If memory serves me right, we then had too much to drink and eat, and we spent far too much. Once the elation subsided, we realised that we only had money left for a short trip to Cambridge, that being the cheapest of all our other planned trips that were to include Oxford, Bristol and Edinburgh. And so it was. We went. We stopped at the Trinity College gates. We asked if they had any information or booklets on available scholarships. A nice lady who clearly took pity on us, two dishevelled Eastern European kids, proposed that, if I wanted, she could also see if there were any Professorial Fellows still on the site so that I could talk with them. She was successful and thus I had my first and only interview with faculty members of Trinity College. It was a lovely chat about medicine, mathematics and universe and many other unrelated topics. I could not catch their names fully, and only much later did I learn that one of them was a Nobel Prize winner.

I must have impressed them in some way, as a few months later I got a letter stating that I have won a prestigious Trinity College Scholarship, which fully funded my subsequent PhD studies.

**8. Are there some exciting moments from you school days, either in Zagreb or in Cambridge that you still remember? Why?**

I will never forget my student exchange days in France, where I did my Gynaecology and Obstetrics rotation with my friend Tanja Buklijaš. My French was really pathetic, but Tanja, whose French was fluent, managed to arrange for both of us to be placed on the same rotation schedule. Thus we stayed together for the entire period of time. During all that time she basically served as my personal translator. We had fabulous time in France escaping the dreary and grey corridors of post war maternity wards in Croatia.

As often, one's plans, are the fool's material. The first thing we found out when we arrived to Rennes was that we were placed in different clinical groups. Second shock was when we realised that in France medical students were used to man the wards. Our third and perhaps our biggest shock was when we realised that French women expected a proper full daily examinations by their gynaecologists, a.k.a two petrified medical students from Croatia. I will leave the rest to your imagination. Two important things that I learned in France were as follows: I was never meant to be a gynaecologist, and there was no chance that I would ever learn to speak French fluently.

**9. You spent several years in Cambridge studying to become a clinical neuropsychiatrist. Was that an intentional detour or you felt that you must learn more clinical psychiatry in order to become a well rounded neuroscientist?**

Oliver Dragojević has a beautiful song about this, and I will only say that this restless nature of my predecessors clearly also resides in me. Having earned my PhD, I felt poorly equipped to tackle the big questions of neuroscience, without truly studying the first-hand patients suffering with these illnesses. Fortunately, these days they have excellent collated courses, which allow young clinicians to be to combine their clinical training with doing their PhD and postdoctoral research. In my time, there was no courses of that kind, and thus, I simply created my own opportunities.

**10. Beside your scientific work do you still practice psychiatry?**

Your question made me smile. It reminds me of my sister who used to say during our arguments that I act as a psychiatrist even in my daily private life.

I find that it is impossible sometimes to switch off, and I believe that it would be foolish, to do so. Thus, I practise my psychiatric principles every day, in every human interaction I have. Psychiatry is the only medical specialty which enables one to navigate through life's little and big challenges.

**11. Why did you move to London?**

We lived in Cambridge for 13 years. I did my PhD, my postdoc, I taught Physiology and subsequently I did most of my clinical neuropsychiatric training there. The decision to move to London coincided with my pregnancy with my son Jakov, and my career decision to re-enter the academic world, and specifically to enter the field of sleep medicine.

**12. You are mostly known for your studies of sleep. Or am I wrong?**

I work in the field of sleep neuroscience, but I hope that my best work is yet to come.

**13. In order to better understand the disturbances of sleep we must first of all study normal sleep. Tell us a few things about normal sleep that the neuroscientists discovered during last few years.**

Most of what we think we know, we know we do not know for sure. Sleep is such a mystical terra incognita that I still get that very important buzz of feeling extremely lucky to work in this field. Sleep allows us unprecedented insight into the inner workings of our brain, which are impossible to decipher during our wakeful moment.

If really pressed to do prepare for you my favourite list of various recent theoretical constructs/partial truths about the sleep and its function I would have to include the following: sleep rhythms as an amazing orchestral symphony that ensures that brain gets rid of toxins, warrants partiture that replays memories, stores the important memory scores in our cortex, and in turn rebuilds our brain's circuitry and software in such way so that our conscious ego may incorporate the effects of wakeful experiences. Other empirical roles of these classical sleep accords include protection of various cortical territories in the brain, for example that of visual cortex during dreaming. If we did not sleep, it is likely that our brain's inbuilt architectural neuroplasticity mavericks would re-build and re-use these cortical territories into subserving the auditory, haptic or other functional modalities.

**14. Insomnia, parasomnia, obstructive sleep apnea—these are the terms for which I have some cultural understanding. Catathrenia—I had to look it up in Wikipedia, but why would one study it?? Could you impress me with a couple of similar terms that I probably never heard off? And**

**maybe you could also convince me that it is important to study such problems!!**

Absolutely. You see, understanding how dream mentation and ambulation arise from sleep's basic physiological components has enticing, and potentially wide reaching basic neuroscientific and wider translational clinical implications. A first case in point is the rapid eye movement (REM) behaviour disorder (RBD), a relatively rare parasomnia that predicts the later occurrence of alpha-synucleinopathies such as Parkinson disease, multiple system atrophy and dementia with Lewy bodies. Unlike sleep-walkers, patients with RBD rarely leave the bed during the re-enactment of their dreams. RBD movements may be independent of spatial co-ordinates of the 'outside-world', and instead rely on (allocentric) brain-generated virtual space-maps. My group is trying to make sense of mechanisms underlying this, which could be precious for patients with dementia. A second case in point are dreams of congenitally blind people whose dreams surprisingly may comprise visual imagery, not dissimilar to that of normally sighted people. We believe that deciphering the brain mechanisms here could help utilize neuroplasticity during the sensory loss later in life, and possibly lead to ability to stimulate functional synesthesia.

**15. I looked you up the data in Google Scholar and found out that 5 of your most cited papers deal with apnea. Why are you interested in apnea?**

Sleep apnea is such a prevalent sleep disorder, and a "somewhat conservative" approach estimated the prevalence of adult OSA in the Americas to be 170 million, or 37% of the population. Thus, as a sleep physician I would be failing my patients if I was not joining in forces trying to decipher the best treatment for this debilitating multi-system chronic disorder.

**16. I like to take an afternoon nap. After I wake up I feel refreshed. I am sure that you must have an explanation for it.**

I am very pleased to hear this. As a clinician I can tell you that this tells me your sleep is of good quality and that you likely also have a good sleep opportunity. What the sleep rhythms symphony does to your brain, whilst you sleep, is perhaps best not pondered upon, lest this stresses you and thus contributes to your night anxiety and subsequent sleep of lesser quality.

**17. I must admit that I was mightily impressed with your published discourse on Elias Canetti in which you also mentioned Ephraim Kishon. Godot found his way even into the title of one of your papers. Chapeau—what an erudition! You mentioned in your previous interview your son as a talented pianist. Where do you find time to let for literature and music enter your life?**

I do not really have time for anything – I work all the time, seriously. Most of my erudition, if you may call it that way, comes from growing up in Sisak, where we were fully expected to know our Karamazovs and distinguish them from our Taras Bulba or The Buddenbrokes. As I have already mentioned, we have had a truly superb education, thanks to many of our esteemed teachers, with special mention of my revered and beloved teacher Tea Rimay.

The truth is, that as a parent, I do not have a choice. As any parent of even vaguely talented child, be it in sport, or music can tell you - this talent of their's sucks you into an unknown world of chauffeuring to the endless events, it makes you spend your weekends waiting outside cold during their practices, and you find you learn simply by diffusion. Therefore, even if you have never previously heard of the pianist Glenn Gould, you suddenly realize you are more than able to hold your court explaining why his rendition of Bach is superior to that of, say, Lang Lang. Supporting my son all the way while he is becoming an accomplished pianist has become an important part of my life (Figure 4)



*Figure 4. My son Jakov Turtko Filip .He is trying his best to impersonate Horowitz. However, as a tall Dalmatian, in future life, he might be more likely confused with Richter or our own Ivo Pogorelic.*





*Figure 5. Svojetlana Kalanj and Katarina Ilić on one of their research visits to my London laboratory. To this day I find my University colleagues still make for the best collaborators, we always laugh a lot, and decades just melt away.*



*Figure 6. The neuroscience congress in Zadar.*

**18. Let's finish this interview with a few questions about your contacts with Croatian scientists. How, when and in which form?**

My generation has slowly but firmly matured, I hope that my youthful colleagues will not resent me for describing them as mature. In any case, many of them are now either running Departments or are positioned on other high functions within the Medical School and Croatian Brain Institute and wider. In my inner sanctum, I am fortunate to count Tihana Jendričko, Zdravko Petanjek, Svjetlana Kalanj-Bognar, Vlatka Boričević and Dinko Mitrečić amongst my closest friends, all from our University days. They are people I call at times of crisis, and to whom I happily turn to when I want to brainstorm or clarify some scientific ideas (Figures 5 and 6).

**19. What are you currently working on? Any neuroscience data on Covid-19?**

Sleeping brain. Also, we are trying to see what that sleeping brain might do in space, during the cosmic travels and under conditions of microgravity.

With regards to Covid-19 and the brain, I think the full truth will be only known in decades to come. I am a pessimistic realist, and I see what it appears to have done to my patients. My worry started even before the current studies got published. For those that did not read them, there are suggestions that Covid-19 may affect brain directly, and cause a special set of cognitive impairments, even accelerating the aging of one's brain for up to 20 years faster than expected.

My family and I have now all had it at least several times(?!). A good percentage of my salary every month goes on placebo multivitamins, prebiotics and other supplements. Living in London, we are living within the ground zero, and our motto has to be that what will come, will come.

**20. Any messages for our younger colleagues who are still studying medicine on Šalata and Rebro?**

I will paraphrase Rita Levi-Montalcini: "Above all, don't fear the difficult moments. The best comes from them".