Science under the spectre of war

Bio
Rajko Igić was born in 1937 in St Ivan (today Despotovo), Serbia. In 1970, he defended his doctoral dissertation at the University of Sarajevo. Igić worked as a professor of pharmacology and toxicology in Tuzla, Banja Luka, and Novi Sad, 1976–1996. Later, he became a scientific advisor (Senior Scientist) at the Stroger Hospital of Cook County, the largest state hospital in the USA, in Chicago. He was editor of the scientific journal *Scripta Medica* (Banja Luka), 2009–2013, and founded the Yugoslav students’ movement ‘Day without cigarette, January 31’.

Further reading
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• Science is a global pursuit.
• We can learn from the story of Dr Rajko Igić, a Serbian pharmacologist and toxicologist.
• Dr Igić’s research helped transform our understanding of eye health.
• He escaped war in Yugoslavia, but not its lingering consequences.
• Science is collaborative and we should help researchers still working under the spectre of war.

Inters have a saying about their succulent charges: struggle builds character, meaning grapes exposed to challenging conditions develop notable wine. The same could be said for scientific research – struggle can produce remarkable output. That is undoubtedly true for Dr Rajko Igić, a Serbian pharmacologist and toxicologist. His work emerged against the backdrop of one of the most harrowing conflicts of modern times, and his story echoes that of other refugee scientists and those still committed to research while surrounded by war.

Igić started his research career after a medical degree and an internship, working as a physician at various medical facilities in the 1970s in Yugoslavia. After a two-year post-doctoral scientific research internship at the University of Oklahoma in the United States, he returned to Yugoslavia, where he embarked on a period of significant research output, interrupted by an event that would shatter his world.

A country ripped apart
In the late 1980s and early 1990s, Yugoslavia, a central and eastern European state containing the socialist republics of Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Slovenia, and Serbia, started to fragment. The ethnically and religiously diverse country had been held together by the force of will of its president, Josip Broz Tito. After his death in May 1980, growing nationalism within several republics started pulling the country apart, exposing centuries of ethnic and religious enmity between Slovenes, Macedonians, Montenegrins, Kosovar Albanians, Bosniaks (Bosnian Muslims), Serbs, who were predominantly Orthodox Christian, and Croats, who were mainly Catholic. In 1991, Slovenia and Croatia declared independence, leading to short conflicts. But, in Bosnia and Herzegovina in 1992, tensions escalated into a full-scale war characterised by brutal ethnic conflict and atrocities; neighbours turned on each other.

At this time, Igić, a Serb, was a professor of pharmacology and toxicology at several institutions in the cities of Tuzla and Banja Luka in Bosnia and Herzegovina. He had been studying the autonomic nervous system and vasoactive peptides, protein fragments known to influence blood pressure and blood flow. Of particular interest to Igić was angiotensin, a peptide hormone critical in regulating blood pressure and fluid and electrolyte balance, and kallikrein, a serine protease enzyme found in the blood and various tissues. He was drawn to their systemic effects within cardiovascular and renal functions but looked beyond the obvious organs – the heart and kidneys. A pivotal moment of Igić’s research came with his identification of the angiotensin-converting enzyme (ACE) in the human eye. It shouldn’t have been there.

Igić’s discovery cast light on a bigger picture: the connection between ocular health and systemic health.
The eye as a window
ACE is a powerful component of the renin-angiotensin system, a hormone system crucial for cardiovascular and renal (kidney) functions. Angiotensin is initially produced by the liver in its inactive form as angiotensinogen. When blood pressure falls, the kidney releases an enzyme called renin, which converts angiotensinogen into angiotensin I, a relatively inactive peptide. It is ACE that converts angiotensin I into angiotensin II, a potent vasoconstrictor – it narrows blood vessels, increasing blood pressure, which, if unguided, threatens the heart.

Igić knew that proper blood flow is crucial for retinal health and function, and his discovery of ACE in the eye helped focus attention on angiotensin II’s role in regulating blood flow to ocular tissues, including the retina. If ACE was present in the eye, this suggested ACE inhibitors designed to reduce blood pressure could also help treat a raft of ocular diseases. This insight helped transform our understanding of eye health.

However, Igić’s discovery cast light on a bigger picture: the connection between ocular health and systemic health, especially blood pressure and fluid and electrolyte regulation. It became clear that the eye can be a window to our overall health. This attracted the attention of two significant players in our understanding of human health.

Collaboration and the clouds of war
Dr Ervin G Erdos and Dr Ulf S von Euler, two prominent scientists known for their significant contributions to physiology and pharmacology, particularly in the field of biochemistry and the study of biologically active peptides and neurotransmitters, took notice of Igić’s work, realizing it built on their foundational research. So, they reached out to him, eventually becoming research collaborators and close friends, and visited Igić at his home in Tuzla in Bosnia and Herzegovina. Little did the three scientists know then that Igić and his home would be targeted.

Before Bosnia and Herzegovina imploded in 1992, Tuzla was known for its ethnically diverse population and relatively harmonious inter-ethnic relations. However, the outbreak of war rekindled centuries-old divisions within this largely Bosnian Muslim-controlled, highly strategic city. The decades of prestige and respect Igić had earned as an industrious academic and highly popular lecturer evaporated, replaced with an animus for his Serbian heritage. Bosnia and Herzegovina turned on one of its most famous scientists.

Sensing the situation, and with his wife and sons safely in Chicago with friends at the time, Igić fled to join his mother in Sombor, Serbia. He had no sooner left when crowds seized his home and property, he lost everything. He was appointed to the Faculty of Medicine at the University of Novi Sad in Serbia, but although his family were safe, they were unsettled and financially precarious. This weighed heavily on Igić. It all became too much for him, and shortly thereafter, he suffered a massive heart attack.

A wake-up call
Igić survived the heart attack and, as soon as he was well enough, joined his family in Chicago, where he was offered the position of senior scientist with the Department of Anaesthesiology and Pain Management at the John H Stroger Jr Hospital of Cook County. Soon, he got a grant from the American Heart Association to support his cardiovascular research. He eventually settled back into academic life, but events in Tuzla and the unfolding war in Bosnia and Herzegovina left an indelible mark. He became a tireless campaigner for peace in the region. He found a voice for his passion in a seemingly unscientific medium: poetry and op-ed articles, which found their way into several publications, including The Chicago Tribune, The New York Times, The Saint Ann’s Review, and a book titled Bear River Review: Responds to War, published in 2006.

Now in his mid-80s, Igić remains committed to science and still publishes scientific and other work, mostly with colleagues. However, his story should be a charged wake-up call. Science is a global pursuit, unhindered by human’s perceived disunity. ACE sits in every eye, irrespective of what people see through it. Right now, scientists remain at work in Syria, Yemen, Afghanistan, Ukraine, the Palestinian territories, and other regions of the world racked by war. They work under extremely challenging conditions, including limited resource access, damaged infrastructure, and personal safety risks. Despite this, they continue their research, driven by a commitment to knowledge and the development of their communities.

Scientific research is often a cumulative and collaborative process, linking researchers from all over the world.
Igić’s work with Erdos and von Euler is also a reminder that scientific research is often a cumulative and collaborative process, linking researchers from all over the world. We owe it to Igić and other scientist refugees and those still facing the ravages of war to offer any support we can. There are various ways to do this. Academic support through research collaboration and providing access to resources is one way, and so is offering funding and grants — financial support for academics can come under strain during wartime. Research organisations can help relocate scientists from war zones by offering haven through fellowships. Sometimes, simply reaching out to provide emotional and psychological support can help, or drawing attention to their plight through advocacy and including them in long-term network and community building.

Whatever way we can, we should help researchers working under the spectre of war. Their struggle adds strength and character to science.

Spring in Serbia: 1946

The days get longer and the sun gets warmer. Nature wakes up and St. Ivan’s gardens and meadows hasten to put on green attire. The war recently ended, freedom comes together with help donated from America. We put on that strangely/cut suit for school. But we are still without shoes; only a few days ago we took off our clumsy wooden clogs, and we are now wearing comfortable felt slippers suitable for kicking the ball. Newly arrived migratory birds enrich the village fauna: two huge storks settle down in the nest perched on the chimney of Uncle Laza’s house. We, first graders, and even the older children used to stop there when returning from school. We are taught religion by Father Bajazit, the tall, bearded, black/cloaked village priest. We don’t pay much attention to his tales until he declares that in two days will come the outing in favor of the Willow Feast.

We set out from our school and cross a vast field dotted with red poppies and different flowers which compete with and look down upon fairly short green grass. We cross the Jegrička, still full of water, and arrive at the field which only a few months ago served as a Russian Army airbase. There are no more of those planes which we, excited, would follow when they would leave on a mission and return with an occasional acrobatic figure. Now the sky is boring and lonely, and we feel sad because we can no longer hear the drone of airplane engines. All the boys are ready, even before growing up, to become pilots.

Our teacher, Milena, a lovely young women, cuts willow twigs for us and gives one to each, when suddenly we hear cries: “Snake, snake!” I turn and see it stretched out, hissing and staring at a small frog, transfixed, motionless. In seconds the trophy was won, but all night I cried, feeling sorry for the frog, repeating to myself, “Why didn’t you jump and escape?”

‘Spring in Serbia’, a poem by Rajko Igić.

What area of research are you drawn to now, and why?

Much progress against cancer has been made in various countries over the past several decades, and the decline in cancer mortality is decreasing mainly due to tobacco smoking reduction, a modifiable risk factor. However, the prevalence of tobacco and nicotine smoking in Serbia and other former Yugoslav states is still quite high. Today in Serbia, the prevalence of women smokers is the same as men, or even slightly higher. In the 1950s, women in this area rarely smoked because it was socially unacceptable, except for some parts of Bosnia. For that reason, the decline of smoking in Serbia is very slow. I continue studying with my colleagues how to reduce smoking, especially combustible tobacco, among students and adults.

In addition, I have recently published several articles and review articles on various topics connected to my research, as well as four poetry books. With colleagues, I published a new edition of my 1980 book on writing and publishing scientific papers.

In December 2023, I suggested to Clarivate to include citations of individual authors (IC, individual/igic citations) in addition to the total number of citations for each publication that they regularly publish. The IC presents a reduced number of citations which depends on the number of authors of a paper. This way, we may solve the present crisis of scientometrics, a quantitative discipline of scientific information introduced more than half a century ago by Eugene E Garfield and Derek J de Solla Price. The IC is a numeric indicator especially useful when articles are written by a large number of authors – 10, 50 or over 100. This indicator may also help to eliminate guest authors or other unnecessary authors.

The best example to illustrate why we need IC is a list of highly cited scientists (1 among 1,000). In 2023, there were 7,125 researchers in that group. Among them was a researcher who in 2008 published a paper titled ‘Recommendations for the treatment of arterial hypertension’, which was cited 12,942 times. In addition to the two main authors, there are about 25 authors, four main reviewers, and fifty assistant reviewers. Each of the contributors to this paper received 12,942 citations! Using the IC, each contributor gets 12,942: 90 = 143 citations. Let us compare these enormous citations to Albert Einstein’s citations. During his lifetime (until 1955) his papers got 1,564 citations. The introduction of IC would partially correct hyper citation, but scientometrics still has to apply classical methods for other estimations.

What advice would you give to researchers working in countries racked by war?

It is best to seek help from colleagues abroad with whom one has collaborated before the war or with those the researcher has met at international congresses and other professional gatherings. After the end of the war, these refugee-scientists and their families should return to support the renewal of research activities in the country and participate in the education of young scientists.

How can we make science more collaborative to include those researchers in war zones?

The most important thing is that scientific institutions, including universities in foreign countries, accept the best researchers and their families from the war zone and enable them temporarily to continue research until the war ends.