

**Prof. Arnošt Gutmann**  
**16. 7. 1910 – 6. 8. 1977**



Ernest Gutmann, 1977, Zlatá Ulička, Prague

At the beginning of the 1940s, a battle against England was raging in the West, and Hitler was bringing about the death or mutilation of millions of lives in the East and Africa. Yet at that time other people belonging to the same biological species devoted their mental and physical strength to other activities. They wrote books, painted pictures, composed and played beautiful music, and performed experiments in laboratories to save human lives, not to destroy them. Among them was the young Czechoslovak Dr. Arnošt Gutmann, who studied nerve regeneration after their injury in the laboratory of Prof. Young in Oxford, England. He wanted to know how nerve cells affect their target tissues, especially the muscles.

For us, who knew Arnošt Gutmann's activities from his department and laboratory during post-war years, a report of his sudden and unexpected death in England on August 6, 1977, at the age of just 67, came as an unbelievable and tragic event. His premature death in the backseat of a car on the way from Cambridge might, as I sincerely believe, be connected with normalization

bullying, to which he was exposed after signing the so-called "Two Thousand Words" declaration during the 1968 Prague Spring. He condemned the invasion of foreign armies in August 1968 as an apparent aggression. Therefore, he was not allowed to lecture at the university, to have official scholars, he was not eligible for the actual scientific leadership of the Institute of Physiology of the Czechoslovak Academy of Sciences, or in the Academy or any college. The emotional excitement during a meeting after many years of separation with some family members and friends at British universities was apparently stronger than the good physical condition of this athlete, active footballer, joyful dancer though with no rhythm and, above all, an excellent neuromuscular physiologist.

Physical and mental fitness – both of which he consciously developed – enabled Arnošt to be an example of extraordinary working activity and optimism in life until his final moments. His drive and characteristic sense of humor spread courage and helped us, his younger collaborators, overcome the difficulties and pitfalls in

both our research and in our personal lives. Arnošt Gutmann was a great creative personality in the field of neuromuscular physiology and pathophysiology. The significance of Gutmann's work was not only nation-wide; his thoughts and the whole concept reached and contributed to the treasury of science on a global scale.

He loved experimental activities even before he has graduated from the Faculty of Medicine in Prague in 1936, where he already volunteered in the laboratories of a biological institute. During World War II, he continued his research work in Oxford under the guidance of Professor John Zachary Young, in a research group which he joined due to the desire to be in the beloved environment of the lab as soon as possible. At that difficult time of war he worked with several extraordinarily talented researchers who later became famous scientists.

In 1945, Arnošt Gutmann returned to his homeland and soon he started to work with full enthusiasm at the Institute of Brain Research at the Medical Faculty, Charles University in Prague. His excellent neuropathological erudition and natural authority led Arnošt Gutmann in 1950 to the leadership of a team of young workers in the new physiological department of the Central Institute of Biology of the Czechoslovak Academy of Sciences. His charismatic personality was beneficial in the selection of students and also later, when he was the head of Department of Physiology and Pathophysiology of the Neuromuscular Functions in the Institute of Physiology of the Czechoslovak Academy of Sciences until the unfortunate year of 1968. He supervised more than twenty post-graduate students and created a Czech school dealing with neuromuscular relations. His first students became step by step independent scientists and led a number of laboratories in his department for years: the electrophysiological laboratory (Radan Beránek, the first intracellular sensing microelectrode in the synapses, Pavel Hník, long-term implanted electrodes in the muscle), histological and later excellent electron microscopical laboratory (Jiřina Zelená, development of muscle mechanoreceptors), biochemical laboratory (Ivo Syrový, slow and fast myosin in muscles) or neuroendocrinological laboratory (Bohumil Jakoubek). He was also in contact with Czechoslovak researchers who became later popular professors of physiology abroad – Gerta Vrbová (the relationship between spinal neurons and muscles, University College, London) and Olga Hudlická (nutrition and microcirculation in muscles,

University of Birmingham, England).

Prof. Gutmann has never denied his basic credo in the laboratory that science is not just a set of knowledge, hypotheses and theories, but must primarily help people, society, and nature. As a physician and humanist he advocated the idea that the results of basic research must be, sooner or later, useful in clinical medicine. His concern was not only the muscle atrophy and the effect of the nervous system on the muscle, which is lost in injuries of limbs and the spinal cord. He knew that none of us are growing younger, and for years he had been dealing with the aging of the musculoskeletal system and the hormonal sensitivity of some skeletal muscles. His papers on this subject appeared in many first-class journals.

The way Prof. Gutmann lead his team of colleagues and their development was typical of his wise and scientifically inspired personality. Initially, with extraordinary inventiveness and intuition, he led his colleagues as an older and more experienced teacher. With time, he left the individual workers to form their own projects, still focused on the study of neuromuscular relationships. Soon he benefited from their divergent development. In a few years, methodically skilled staff worked independently and they were often pioneers of completely new methods (mechanoreceptive automatic analyzers of muscle contractions – Vojtěch Rohlíček, microelectrophysiological amplifiers – Evžen Ujec, enzymatic profiles of muscles – Arnošt Bass).

During the war, Young's classic works on the regeneration of peripheral nerves were already-published. But there was a breakthrough finding obtained later in Prague that injury to the nerve close to the muscle would cause a much faster degeneration of the neuromuscular junction and a faster development of muscular atrophy than the same injury to the nerve inflicted further away from the muscle, even though in both cases the muscle contractions were immediately abolished (Gutmann et al. *Česk fysiolog* 4: 181, 1955).

Prague studies of muscular denervation atrophies, reflexive atrophies, and atrophies after tenotomy (tendon transection) led to new ideas about the trophic influence of the nervous system on skeletal muscles. Nerves from the central nervous system trigger, according to his original concept, not only a motion response, but they also transmit maintenance information for the good condition of the contractile apparatus, mitochondria, tendons and proprioceptors. They also trigger the genetic expression of several growth and protection factors. Moreover, there is an important cross-

talking factor, a mutual interaction between the nerves and the muscles, to maintain their structure and function. Today we know that one such substance is nitric oxide (Vyskočil *Neurochem Res* **28**: 575, 2003).

These ideas, supported by experimental findings, were presented at two symposia with international participation in 1956 and 1962. These were the conference on "*The Nervous Control of Metabolism and Active Ion Transport*" and the symposium "*The Effect of Use and Disuse on Neuromuscular Functions*". In 1962, he edited a monography *The Denervated Muscle*, which renewed interest in this issue, and launched a period of intensive global research on neuromuscular trophics. I have recently seen a much worn copy of this monograph at the fingertips of Prof. Gerta Vrbová in her London lab.

Arnošt Gutmann had a considerably broad range of interests and an ability to implement general biology laws in his own detailed work, and thus to refine them. Nature, however, never revealed its secrets to him easily. His approach to solving the basic problems of inter-cell relations was reminiscent of an ancient hero. He did not seem to take into account the experimental problems of the pre-molecular-biology era. With his enthusiasm and wide-ranging insight, he was always able to get experts from other methodical fields for collaboration; including pioneering intracellular electrophysiology, electron microscopy and autohistoradiography. It is almost unbelievable how many approaches Arnošt Gutmann used in solving the issues of nervous trophics. He studied the anatomical, contractile and energetic differences between the muscles; he forced muscles to change their activity by crossing the nerve growth from slow or fast muscles. Together with Prof. B.M. Carlsson from the University of Michigan in the United States, they performed transplantations and muscle regeneration in Prague and also tested the use of transplantations in clinical practice, a visionary experiment at that time.

Developmental aspects were no less important to Arnošt. In addition to studies of early developmental stages, he and his colleagues were dealing with the gerontology of the neuromuscular system from the 1960s. The results of this research are summarized in a monograph on the aging of the neuromuscular system, written together with Věra Hanzlíková, with whom in 1966 he published the first article on this topic in *Nature*. Thanks to his creative mind, Prof. Gutmann utilized very specific approaches and models in his research, such as the study of hormonal regulation of muscle in insects, genetic and immunological approaches. He also conducted research on muscular hypertrophy, studied the

effect of impaired blood flow (ischemia) on muscle, and was interested in changes during hibernation (together with F. Vyskočil) and how we adapt to hypothermia.

Thanks to his exceptional personality, prof. Gutmann also initiated extensive international collaborations. Due to complicated contacts with Western colleagues at their workplaces, Arnošt encouraged cooperation with Eastern scientists, in which he both participated himself and also encouraged his colleagues to take part. It was clear to him that these colleagues were neither present in the tanks that invaded Prague in 1968, nor had they sent them to us. From 1957 onwards, together with the Polish Prof. Konorski and the Soviet Prof. Asratjan, they became initiators of international symposia of neurophysiological laboratories east of the iron curtain. These symposia laid the foundation for extensive collaboration in neurophysiology, the Intermozg program. Some interesting projects, such as the physiology of laboratory rats on a satellite and a pioneering study of the effects of weightless conditions on the musculoskeletal apparatus, have been implemented in this program.

During the normalization of the 1970s, another of Arnošt's human properties was manifested – selflessness. He himself could not leave the country for the West for years (and as we know, his first short-term visit to England in 1977 became fatal). However, he was happy to see a number of co-workers to work successfully abroad – Věra Hanzlíková in Italian Padua, Isa Jirmanová in Swedish Lund, Milena Burešová and Ivan Hájek as experts in Uganda.

The exceptional scientific productivity of Prof. Gutmann could not be hindered by any political persecution. Since in biomedicine (unlike in the socio-historical sciences) we were allowed to publish articles in Western scientific press during the period of normalization, Arnošt took full advantage. He published both at home and abroad and was able to prepare a new publication almost every 14 days. At that time, we had a successful system of internal editing, where in the seminars the new manuscripts were discussed together, which to some extent replaced the lack of communication with foreign colleagues, and increased the chances of acceptance to publication in good magazines. The most prolific author was almost always Arnošt and his closest associates, and so we very often had to read some of his new work. He never avoided opposition, so at seminars we occasionally passionately shredded some paragraphs of his manuscript, and thus we learnt precise and logical expressions and, after all, practiced professional English.

Arnošt Gutmann wrote and participated in more than 400 articles, a number of monographs, book chapters and reviews. His current Hirsch Index reached 39. Perhaps his productivity based on Faraday's words "work, finish, publish" was also sustained with the special way he worked at home, dividing the night into four-hour sections of sleeping and writing or studying; although the "physiology" of this approach could be discussed, for him it was undoubtedly effective and productive.

Arnošt was not a collector of titles and honors; and taking the importance of his work into account, he did not get many of those. It is true that in 1964 he was awarded the State Prize and in the following year he was elected a corresponding member of Czechoslovak Academy of the Sciences, but that is actually all; if we do not count prizes from professional societies (he was awarded the prize of the J. E. Purkyně Physiological Society in 1971 and the Gerontological Society Award in 1972). He never became a regular-full Academician (a member of the Learned Society as it is today). However, it certainly did not mean much to him. He had other ambitions and those he achieved. He became the founder of two Czechoslovak physiological journals that are still published today (*Physiologia Bohemoslovaca*, now *Physiological Research* and *Československá fyziologie/Czechoslovak Physiology*), and for several years he was their chief editor. It was of great importance at that time, because our English-printed journal was one of our few entry points to the world; even today, it plays its role as an information channel, because their articles are easily accessible on the internet.

A manifestation of the general recognition of the scientific merits of prof. Gutmann was his regular or

honorary membership in a number of international scientific societies: for example membership in the committee for neuromuscular diseases of the World Federation of Neurology, in the German Academy of Sciences Leopoldina in Halle, honorary membership in the American Physiological Society, membership in the New York Academy of Sciences, the World Neurochemical Society, The British Physiological Society, British Neuropathological Society, Society for Experimental Biology, membership in the Academia Nazionale dei Lincei in Rome and others.

Arnošt was also a good artist. He painted slightly clouded landscapes, especially from the Jizera Mountains, where the Gutmann family had a cottage in Janov nad Nisou. Even after reaching 60, he kept learning foreign languages (e.g. Italian). He loved Janáček's operas, and never missed our quartet concerts, which we performed together with the skilful violinist Pavel Hník, one of Arnošt's first Ph.D. students, from time to time in the institute or during various symposia.

The life-enhancing nature and incredible optimism allowed Arnošt to accept the "joys and sorrows" of life with open eyes. He also helped us, his collaborators and students, not only to uncover the mysteries of nature. Facing his professional and human qualities, we can still examine ourselves, and in the mirror of his integrated personality see and appreciate what the world of science and each of us personally owe him.

František Vyskočil