BIOLOGIJA. 2016. Vol. 62. No. 3. P. 202–206

In memoriam

Academician Emeritus Alfonsas Merkys (1927–2016)

Aurika Ričkienė
Nature Research Centre

Leonida Novickienė
Lithuanian Society of Plant Physiologists

On 19 May 2016, the Lithuanian academic community lost Alfonsas Merkys, an outstanding scientist, the founder and leading figure of plant physiology research in Lithuania, professor and academician of the Lithuanian Academy of Sciences. His works cover a wide range of research from plant growth, development and productivity, and reaction to the force of gravity to the questions of the history of science. Alfonsas Merkys's work, which noticeably stimulates further research, has been continued by his students up until now.

* Corresponding author. E-mail: aurika.rickiene@botanika.lt

Alfonsas Merkys was born on 20 February 1927 in Puožas village, Kupiškis district. After getting education in agronomy at the School of Agronomy of Salos, he for one year studied at the K. A. Timiryazev Moscow Agricultural Academy. In 1949, Merkys returned to Lithuania and continued studies at the Faculty of Natural Sciences of Vilnius University until 1953. Advised by the famous plant physiologist Professor Jonas Dagys, he chose the specialty of plant physiology. In 1953, having recognised the talent of the young student, Jonas Dagys recommended that he should advance his studies of plant physiology at the Department of Plant Physiology headed by Professor

Boris Rubin at the Faculty of Biology and Soil of Lomonosov Moscow State University. Merkys's supervisor for doctoral studies Nina Turkova, a doctor of biological sciences, suggested that he should examine the physiological causes of lodging in cereals. The young scientist summarized the material of research in his thesis *Ispytanie khimicheskikh sposobov bor'by s poleganiem zlakov* (Merkys, 1956) which he defended at Lomonosov Moscow State University in 1957.

In the same year he returned to Lithuania and began to work at the Laboratory of Plant Physiology of the Institute of Biology of the Lithuanian Academy of Sciences, which was established by his teacher Professor Jonas Dagys. In 1961, Alfonsas Merkys became the head of the Laboratory of Plant Physiology of the Institute of Botany of the Lithuanian Academy of Sciences, brought together a team of young researchers and started to investigate plant response to gravity. Even during his doctoral studies Merkys concluded that lodging in cereals depended on a combination of physical and biochemical processes occurring in plants during reaction to gravity, and on mechanical properties of the stem. The reaction of plants to gravity became the basis of his research, which he subsequently developed in three dimensions, summarized in three monographs and in more than 300 scientific articles.

In the middle of the twentieth century, plant response to gravity was explained by two main theories. The hypothesis of Nemec and Haberlandt explained how the plant feels the force of gravity, and the theory of Kholodny and Vent described the response to gravitational irritation as a differential distribution of plant hormone auxin (indole-3-acetic acid) along a gravitropically irritated axial plant organ. These theories were the starting point for the research of Merkys and his co-workers in the 1960s. They studied systems that take gravitational irritation, changes in bioelectric parameters of tissues, the nature of energy metabolism, transport and function of plant hormone auxin in response to gravity, and the importance of this reaction for supporting the vertical position of cereals.

In 1966, Alfonsas Merkys defended his doctoral thesis *Geotropizm rastenij i ego znachenie dlja orentacii pobegov* (Merkys, 1966) and in 1973 he published the monograph *Geotropicheskaja reakcija rastenij* (Merkys, 1973). His book received international recognition as the first work dedicated to research of plant gravitropic reaction.

In his doctoral thesis Merkys formulated and substantiated scientific directions that he had been developing throughout his active academic career, that is, transport, metabolism and function of plant hormone auxin during plant growth and development; the value of gravity in the processes of growth, spatial orientation and development of plants; search for physiological analogues of phytohormones, their synthesis, activity and practical application.

Based on advances in molecular biology, the view that hormones are functioning in some way through the regulation of gene activity that causes physiological changes in the cell evolved in the middle of the twentieth century. The view that the plant hormone auxin implements its physiological function through the regulation of gene activity was first expressed by Merkys in 1966 in Bulgaria, at the International Symposium on Plant Stimulation. In 1969 in Tashkent, at the Second Congress of Biochemistry of the Soviet Union, Merkys voiced the idea that auxin develops its physiological effect by changing protein synthesis in complexes with proteins.

Over the years of continuous research together with his co-workers, Merkys found that in different compartments of growing by elongation the plant cell auxin-protein complexes are generated, the signals are transduced to the nucleus and activate or alter protein synthesis. Most of the results relating to transport, metabolism and function of plant hormone auxin are published in A. Merkys's monograph *Auksin i rost rastenij* (Merkys, 1982).

When in 1957 the first artificial satellite of the Earth was launched and the Soviet Union launched its space program, Lithuanian plant physiologists were invited to take part in it. As early as in 1972–1973, the experiments

designed by the Lithuanians were carried out aboard spacecraft Soyuz 12 and Soyuz 13. Lithuanian researchers designed unique instruments for the study of plant growth in artificial gravity conditions on the Earth and in the outer space.

Alfonsas Merkys was a co-author of unique experiments with plants in spacecraft Soyuz 12, Soyuz 13, Soyuz 15, and orbital stations Salyut 4, Salyut 6, Salyut 7 and Mir. Lithuanian plant physiologists established threshold values of gravitational sensitivity of individual organs of plants, and in 1982, for the first time in the history of plant science, they conducted a successful experiment of full-cycle (i. e., from seed to seed) growth of *Arabidopsis thaliana* Heynh. on the orbital station Salyut 7. This experiment confirmed that the plant is able to go through the whole cycle of ontogenesis in space flight conditions.

In 1990, Merkys published the data obtained from space stations and in conditions of simulated weightlessness on the Earth in the monograph *Sila tjazhesti v processah rosta rastenij* (Merkys, 1990).

The developed theoretical generalizations in plant growth physiology laid foundations of applied research in chemical plant growth regulation. Under the guidance of Merkys, the programme for the synthesis of original compounds based on the modification of the chemical structure of the natural growth regulators was developed. These studies confirmed the assumption of the possibility of creating new compounds of specialized activities – advanced analogues of auxin: α-naphthylacetic acid and derivatives of quaternary ammonium salts (morpholine, piperidine and diethylamine) for targeted regulation of growth and development of individual organs of plants. Thus, theoretical foundations have been created for the synthesis of new, highly specialized physiological analogues of phytohormones and retardants in order to control the growth and productivity of economically important plant organs. Positive results were achieved and tested in collaboration with plant physiologists, chemists and specialists of agriculture, agronomists and botanists from different countries: Lithuania, Belarus, Latvia, Russia, Moldova, Poland, and Hungary. Eight new derivatives of auxin – α-naphthylacetic acid and quaternary ammonium salts created by Merkys and his co-workers received the invention status.

Twice – in 1974 and 2001 (with co-authors) – Alfonsas Merkys was bestowed the Lithuanian Science Award for his contribution to the development of science in Lithuania.

Merkys generously passed the acquired knowledge on to young people. From 1961to 1970 and from 1990 to 2001, he taught courses of biophysics, plant growth and morphogenesis, and plant physiology, as well as organized specialized practices for plant physiologists at Vilnius University. In 1968, he was appointed to the position of professor. During the period covering more than forty years, Merkys supervised 34 doctoral theses and was a consultant for three works of habilitation. His initiated studies have been continued by his students up until now.

Merkys's contribution to the studies of the history of science is outstanding. He professionally researched the history of biology. In 1977, he participated at the World Congress of Historians of Science. In 1995, he published a book about the life and academic activity of Stanislovas Jundzilas, a famous botanist of the eighteenth-nineteenth century, and about Jonas Dagys, a plant physiologist of the twentieth century (Merkys, 1995). Also, he supervised two doctoral dissertations in the field of history of botanical science. The research fields he had initiated in the history of botany and plant physiology have been continued by one of his students up until now.

Alfonsas Merkys made an immeasurable contribution to the formation and organization of research trends in botanical science in Lithuania. Being a member of the Presidium of the Lithuanian Academy of Sciences from 1976 to1992, a deputy director of the Institute of Botany of the Lithuanian Academy of Sciences from 1962 to 1981, director of the Institute of Botany of the Lithuanian Academy of Sciences in 1981–1989, and head of the Laboratory of

Plant Physiology of the Institute of Botany from 1961 to 2001, he directly managed the guidelines of experimental botany in Lithuania.

Alfonsas Merkys will be remembered for his role in the dissemination of scientific knowledge. From 1992 to 2003, he was the executive editor of *Biology*, a scientific journal of the Lithuanian Academy of Sciences. He was also a member of the editorial board and of the scientific council of the Russian academic journal *Plant Physiology*, an honorary member of the Society of Russian Plant Physiologists, a member of the Society of Scandinavian Plant Physiologist, a curator of space plant physiology research in the Space Exploration and Utilization Commission of the Russian Academy of Sciences, and a national representative of the Committee on Space Research (COSPAR). In 1988, he founded the Society of Lithuanian Plant Physiologists and was its chairman for more than twenty years. The society published books, organized several international scientific conferences and seminars attended by world-known scientists such as developers of the hormonal theory of flowering Mikhail Chailakhjan and Antony Lang, researchers of plant gravitational biology George Malachinski and Andreas Sievers. In 1993, together with the Senate of Vilnius University and the Presidium of the Lithuanian Academy of Sciences, the Lithuanian Society of Plant Physiologists held an academic event, *Readings of Stanislovas Jundzilas and Jonas Dagys*, in which scientists dealt with the issues of modern experimental plant biology.

Merkys was active everywhere: he took interest in environmental protection, from 1967 was a long-standing member of the board of the Lithuanian Hunters and Fishers Association, and from 1975 was a member of the board of the International Society of Wildlife Protection and Hunting. From 1989 to 1991 he was the president of the Lithuanian Society of Environmental Protection.

He lived a long, productive, and meaningful life. He used to say that no national cultures and no state structures could survive without the protection of citizens' honour and education, and he worked tirelessly for the progress of science, the state and its people.

Alfonsas Merkys is survived by his wife, Teresė, son, Saulius, daughter, Vaiva, and five grandchildren.

References

1. Merkys A. *Ispytanie khimicheskikh sposobov bor'by s poleganiem zlakov. Avtoreferat dissertacii na soiskanie uchjennoj stepeni kandidata biologicheskih nauk*. [Chemical Action against Lodging in Cereals]. Vilnius: 1956. Russian.
2. Merkys A. *Geotropizm rastenij i ego znachenie dlja orentacii pobegov*. *Avtoreferat dissertacii na soiskanie uchjennoj stepeni doktora biologicheskih nauk*. [Plant Geotropism and Its Significance for the Spatial Orientation of Seedlings] – Vilnius: 1966. Russian.
3. Merkys A. *Geotropicheskaja reakcija rastenij*. [Geotropic Reaction of Plants]. Vilnius: Mokslas, 1973. Russian.
4. Merkys A. *Auksin i rost rastenij* [Auxin and the Growth of Plants]. Vilnius: Mintis, 1982. Russian.
5. Merkys A. *Sila tjazhesti v processah rosta rastenij* [The Force of Gravity in the Processes of Plant Growth]. Moskva: Nauka, 1990. Russian.
6. Merkys A. *Prof. S. Jundzilo ir prof. J. Dagio gyvenimas ir veikla*. [Life and Work of Prof. Stanislovas Jundzilas and Professor Jonas Dagys]. Vilnius: VU leidykla, 1994. Lithuanian.

Aurika Ričkienė, Leonida Navickienė

IN MEMORIAM AKADEMIKUI EMERITUI ALFONSUI MERKIUI (1927–2016)

Šių metų gegužės 19 d. netekome vieno iškiliausių dvidešimto amžiaus Lietuvos mokslininkų, žymaus augalų fiziologo, mokslo organizatoriaus, mokslo istoriko, akademiko Alfonso Merkio.

Alfonsas Merkys gimė 1927 m. vasario 20 dieną Puožo kaime, Kupiškio rajone. 1949–1953 m. studijavo Vilniaus universiteto Gamtos mokslų fakultete,

vadovaujamas žymaus to meto augalų fiziologo profesoriaus Jono Dagio, pasirinko augalų fiziologo specialybę. 1953 m. pradėjo studijuoti doktorantūroje Maskvos valstybinio M. V. Lomonosovo universiteto Biologijos-dirvožemio fakulteto Augalų fiziologijos katedroje. Vadovaujamas biologijos mokslų daktarės Ninos Turkovos jis tyrė javų išgulimo fiziologines priežastis. Tyrimų medžiagą būsimasis mokslininkas apibendrino disertacijoje „Cheminių priemonių panaudojimas prieš javų išgulimą“, kurią apgynė 1957 m. Maskvos valstybiniame M. V. Lomonosovo universitete. Tais pačiais metais jis grįžo į Lietuvą ir pradėjo dirbti Lietuvos mokslų akademijos Biologijos instituto Augalų fiziologijos laboratorijoje. 1961 m. Alfonsas Merkys tapo Lietuvos mokslų akademijos Botanikos instituto Augalų fiziologijos laboratorijos vadovu, subūrė jauną kolektyvą ir išplėtojo augalo reakcijos į gravitaciją tyrimus.

Alfonsas Merkys tyrė augalų augimo fiziologijos klausimus: tropizmų ir fitohormonų fiziologijos teoriją, atliko augalų augimo ir vystymosi kosminiuose laivuose ir stotyse tyrimus, su bendradarbiais pirmą kartą mokslo istorijoje nustatė, kad augalai kosmose mikrosvarumo sąlygomis gali praeiti visą gyvybinį ciklą. Jo vadovaujama mokslininkų grupė susintetino ir ištyrė daugiau kaip 20 augalams svarbių fitohormonų fiziologinių analogų. Bendrąja prasme Alfonsas Merkys suformavo tris augalo augimo fiziologijos mokslinių tyrimų kryptis: fitohormono auksino transportas, metabolizmas ir veikla augalo augimo ir morfogenezės procese; gravitacijos reikšmė augalo augimo, erdvinės orientacijos ir vystymosi procese; fitohormonų fiziologinių analogų paieška: jų sintezė, veiklos tyrimas ir praktinis pritaikymas. Šiomis temomis jis publikavo tris monografijas – *Augalų geotropinė reakcija* (Merkys, 1973), *Auksinas ir augalų augimas* (Merkys, 1982), *Sunkio jėga augalų augimo procesuose* (Merkys, 1990), kartu su bendraautoriais paskelbė daugiau nei 300 mokslinių straipsnių, buvo dešimties išradimų bendraautoris. Konsultavo 3 habilituotų daktarų ir vadovavo daugiau nei trisdešimties mokslo daktarų disertacijų parengimui. Jo darbai du kartus – 1974 ir 2001 metais (su bendraautoriais) – buvo įvertinti Lietuvos mokslo premijomis.

Alfonsas Merkys 1961–1970 m. ir 1990–2001 m. Vilniaus universitete dėstė biofizikos, augalų augimo ir morfogenezės, augalų fiziologijos kursus.

Akademikas buvo Lietuvos augalų fiziologų draugijos steigėjas ir ilgametis jos pirmininkas, Lietuvos mokslų akademijos Prezidiumo, Vilniaus universiteto Senato ir Lietuvos augalų fiziologų draugijos renginio „Prof. Stanislovo Jundzilo ir prof. Jono Dagio skaitymai“ organizatorius, aktyvus mokslo istorijos tyrinėtojas, Rusijos augalų fiziologų draugijos garbės narys, Skandinavų augalų fiziologų draugijos narys, Rusijos MA kosminės erdvės tyrimo ir panaudojimo komisijos kosminės augalų fiziologijos kuratorius, COSPAR Nacionalinės komisijos atstovas. Jis ilgus metus dirbo žurnalo *Biologija* vyriausiuoju redaktoriumi, buvo Rusijos MA žurnalo „Augalų fiziologija“ redakcinės kolegijos narys. Akademikas rūpinosi gamtos apsauga: buvo Lietuvos medžiotojų ir žvejų draugijos valdybos nariu, nuo 1975 m. – tarptautinės draugijos „Laukinės gyvūnijos apsauga ir medžioklė“ valdybos nariu, 1989–1991 m. – Lietuvos gamtos apsaugos draugijos pirmininku.

Akademikas Alfonsas Merkys nugyveno ilgą ir prasmingą gyvenimą. Jis dažnai sakydavo, kad tautų kultūra ir valstybės sankloda griūva, kai piliečių garbė ir išsilavinimas neglobojami, ir dirbo mokslo, valstybės ir žmonių labui.