



**COMMEMORATION OF THE HUNDREDTH ANNIVERSARY OF THE
BIRTH OF GÉZA ENTZ, JR.**

By

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Géza Entz, Jr. was an outstanding researcher of biology in Hungary, to whom we pay the tribute of respect on the hundredth anniversary of his birth. He was an example of dutifulness and humaneness. His whole life was spent in purposeful and serious work. Helped by his high-principled character he was able to endure the hardships of life. He loved the teaching profession and scientific work, these ideals he served with devotion. His lectures were deep in ideas, high of level and permeated by enthusiasm, everybody listened to them with delight. Also as a scientist he took in an outstanding place among biologists, and enriched the science of biology with the results of his scientific investigations. In this way his name became known not only in Hungary but also beyond the borders of this country. The hundredth anniversaries of the birth of eminent people are celebrated by those who used to know them in person, who have live memories. The later centennaries and commemorations are already free from the personal connections and rely merely on data.

G é z a E n t z, J r. was born on 30th May, 1875 in Kolozsvár, as a member of the family Entz who had an important part in scientific life for generations. He was the third of the family who, with the wide range of his activity, with the results of his scientific research work could enrich the science of biology with numerous valuable contributions. The first was his grandfather, F e r e n c E n t z who, after having taken his medical degree, practised as a physician first in Lower Austria, then in Bohemia and eventually settled down in Mezőkomárom, where he was equally interested in natural history, medical practice and horticulture. His predilection for the sciences of natural history is shown by his prize-winning treatise on the outline of the natural historic and medical aspects of the Sió region, in which, ahead of the ecological trend of biological research of our age he summarizes his observations conducted in the years 1831–42. Still in Mezőkomárom, he took up scientific and practical gardening: mainly apple- and wine growing. At the same time he started up-to-date professional training in gardening and became finally the first director of the Vinedressers' and Gardeners' Training School of Buda (the predecessor today's University of Horticulture). His interest in natural sciences was not superficial, his attraction towards biology is a proof of this; this inclination has survived in the Entz family up to our very days.

The second was G é z a E n t z, S r., son of Ferenc Entz. After having taken his M. D., in 1867 he became assistant of T i v a d a r M a r g ó, professor of zoology of the University of Budapest. He worked there till autumn 1869, and began studying Protozoa most certainly as early as that time. In 1869 he was appointed teacher of the agricultural school at Kolozsmonostor, then, in 1873 became professor of zoology at the University of Kolozsvár. In 1889 he was invited to the professorship of zoology of the Technical University and, eventually, in 1901 he was appointed professor of zoology and comparative anatomy of the University of Budapest, as a successor of T i v a d a r M a r g ó. There he worked up to the time of his retirement in 1914. Even at the beginning of his career he was attracted by the world of life of still waters and lakes, and of the living beings of that world unicellular organisms engaged his attention in the first place. The most significant result of his researches was the discovery of the symbiosis of unicellular animals and algae, of which he reported when still a professor at Kolozsvár.

G é z a E n t z, J r. studied partly at Kolozsvár, partly at the Faculty of Arts of the University of Budapest, where he attended the high-level lectures of his father. Without doubt, these enthusiastic and captivating lectures had on him the deepest effect of all, and this accompanied him through his entire career. Having finished his studies, he obtained a middle-school teacher's diploma in 1899, and took his Ph.D. in 1902. In 1907 he was habilitated "Privatdocent" of the subject protistology at the University of Budapest, and in 1916 of the subject hydrobiology and pisciculture at the Technical University of Budapest.

He began his career in 1898, at the Technical University, first he

worked at the Institute of Botany under professor Gyula Klein, then at the Zoological Institute under professor Jenő Dada, as assistant and first assistant, respectively, up to 1913. On account of propitious circumstances, this first period of his scientific activity was of decisive significance in his subsequent work. In the first place, he was interested in the life of the waters; he set himself the aim of studying unicellular organisms. However, in this respect he was also engaged in some practical questions of zoology, among others indirectly in fish-breeding, the basis of which is hydrobiology. As early as 1910 he was commissioned to hold courses on subjects of natural history at the Erzsébet Women's School, then, in 1913, at the successor of that School, the Erzsébet Training School for Higher Elementary School Teachers, he was appointed professor of biology. At the end of the 1913–1920 period of his career, in consequence of the unfavourable turn circumstances took at that time, he went abroad accepting an offer by the Utrecht University. There he became first assistant and then conservator at the Zoological Institute. During the summer vacations he worked at the Den Helder Station of Maritime Biology and was in charge of the summer courses in biology. After these preliminaries, and after having gained extensive and valuable experience, he was appointed director of the Balaton Section of the Hungarian Biological Research Institute of Tihany in 1929, then, in 1936, after the resignation of Professor Frigyes Verzár, director of the Section of General Biology, he took over the direction of the whole Institute. Meanwhile, in 1932 he became director general of the Hungarian National History Museum organized at that time, eventually in summer 1934 he was appointed professor of general zoology and comparative anatomy at the University of Budapest.

In his research- and educational work, particularly in directing of the Hungarian Biological Research Institute of Tihany, he made use of the experience gained during his numerous study trips abroad. Two times (1903, 1904) he did research work at the Zoological Station of Naples, where he studied biological problems of the sea. Later he participated in a hydrobiological course of lectures at Bergen (1908) and also visited the Station of Maritime Biology of Heligoland (1911). With a view to conducting research work gaining experience and getting acquainted with various research institutes, he made further study tours to Vienna (1912), Munich (1912–1913) and Berlin (1913). At that time these institutes were not yet independent, they belonged to universities. For this reason their programmes were actually determined by the professors of the respective universities. These trips abroad enabled him to establish personal contacts with renowned professors and researchers. This holds especially for Munich, to that city he was attracted by the wide knowledge and fame of Richard Hertwig.

His participation in a number of zoological, limnological and anthropological congresses also enabled him to enter into relation with numerous illustrious foreign scientists and, at the same time, to report on research activity. Even at the time he was assistant at the Technical University,

he took part with his father in the VIth International Zoological Congress held in Berne. In later years he participated in the work of the Xth Congress, organized in Budapest, and lectured there on the Tintinnidae especially on the structure and function of the membranules of an Oligotrich, *Petalotricha ampulla*, then, at the XIth Congress held in Padova in 1930, he read a paper on the breaking into small pieces of food in the cytoplasm of certain Protists. Eventually, at the XIIth Zoological Congress, held in Lisbon, he gave major comprehensive lectures on the fibrils in the plasm of an Oligotrich, *Favella Ehrenbergii*, as well as on the fauna of Lake Balaton.

In addition, he participated in and delivered lectures at the 23rd Jahresversammlung of the Deutsche Zoologische Gesellschaft, held in Berlin in 1913, further in the XVIIIth Congress of the Neederlandsch. Nat. en Geneezk. Verenig. of Utrecht, in 1921. Let it be mentioned in this connection that he was ordinary member of the Deutsche Zoologische Gesellschaft, of the Dutch Dierkundige Vereniging and honorary member of the Société Royale de Belgique. In 1934 he was elected president of the Hungarian Adria Society, where he delivered his presidential opening address under the title: Recent trends in the biological research of the sea; between 1934 and 1937 he was member of the editorial board of the journal of this Society, "A tenger" (The Sea). He eagerly supported the work of the Hungarian Society of Natural Sciences and was member of its committee between 1913 and 1923, as well as between 1930 and 1943. Of its Section of Zoology he was vice-president between 1932 and 1935, further president from 1935 to 1938. For several years he took part in the work of the executive committee of that Section. He took part from 1935 to 1937 in the work of the editorial board of "Állattani Közlemények" (Zoological Publications). He was also editor of the periodical "Publications of the Hungarian Biological Research Instituts".

He published numerous educational articles on a variety of subjects in "Természettudományi Közlöny" (Journal of Natural Science), in the periodical "A tenger" (The Sea) and in other periodical reviews. He published the results of his scientific work in nearly 100 papers in the journal "A Magyar Tudományos Akadémia Matematikai és Természettudományi Értesítője" (Mathematical and Scientific Bulletin of the Hungarian Academy of Sciences), in the "Mathematischer und Naturwissenschaftlicher Anzeiger der Ungarischen Akademie der Wissenschaften" in "Archiv für Protistenkunde", in the "Publications of the Hungarian Biological Research Institute", in the periodical "Állattani Közlemények" (Zoological Publications) of the Zoological Section. In addition, he published 440 reviews on subjects of protistology and cytology in the periodical "Berichte über die wissenschaftliche Biologie".

In the course of his career, Géza Entz did multifold and wide spectred work at various levels of high-school and university education, respectively. He could make good use of experience acquired at university departments in Hungary, as well as during his numerous study

trips abroad and in his work of higher education at a great number of universities abroad when his work of university education began as assistant of the Technical University. There he obtained practice in the teaching of subjects of partly botanical, partly zoological, mainly protistological, limnological and practical zoological bearing.

Later, as professor of zoology at the Erzsébet Women's School, he developed the teaching of this subject with great energy. He also drew his students into the work of preparing the training courses with the aim of intensifying the subjectmatter of the theoretical courses, as well as into the production of the demonstrating material, mainly tables, and furthered in this way the students practical training. The study excursions led by him served the purpose of widening the students' knowledge of biology and of making them acquainted with the methodology of sampling. It appears, from all these efforts of his, that he attached great importance to the practical training of the prospective higher elementary school teachers. He completed this work by giving directions and offering help to the students in their demonstration lessons; he was present at these trial lessons and furthered the advancement of the probationary teachers in educational work by expressing his opinion about the classes and by well-meaning criticism. Having left for Utrecht, and working there as assistant and conservator under the professors of zoology *van Ihle*, *Nierstrass* and *Versluys*, as well as under the professor of physiology, *Jordan*, he got acquainted with the system and aspect of university education in the Netherlands. He intensively took part in the work of the Zoological Institute and also held courses of summer practice, furthermore, he was author of certain chapters (Protozoa, Mesozoa, Cytology, as well as Fecundation) of the textbooks *General- and Special Zoology* edited by professors *van Ihle* and *Nierstrass*.

Having returned to Hungary, he did not take part in university teaching for five years, until, in 1934 he was appointed professor of the Institute of General and Comparative Anatomy, University of Budapest. So it was only in the last decade of his life that he got into a position that made it possible for him to modernize and improve university education in general zoology relying on his wide experience and in compliance with his own ideas. In his lectures he stressed the necessity of a comprehensive biological aspect in creating a close connection among the various branches of zoology; the productivity of such an attitude was demonstrated not only in his lectures but also by the results of his own scientific research. Like his father, he made a deep impression on his students with the captivating force of his lectures, and was able to arouse their interest in the various branches of general zoology. His modernizing endeavours mainly found expression in the fact, that while before him lectures in general zoology were in the first place of morphological tendency, *G é z a E n t z* also laid stress on physiology besides morphology, so that the two scientific branches came to be expressed with equal weight in his lectures. He helped the introduction of the

physiological and functional attitude also by organizing a proseminary in physiology. The functional aspect was to be felt also before in the scientific work of the Institute, and it continued to gain in intensity as shown by the doctoral dissertations written there, dealing mainly with subjects of histophysiology, rhythm research, limnology and protistology. The functional anatomical and comparative physiological trend which was started by G é z a E n t z, also survived after his death, moreover, it continued to develop, so that early in the 50s also independent courses of lectures on comparative animal physiology were being given besides lectures of functional comparative anatomy, together with corresponding practical courses. In this way the Department obtained a twofold profile, and in the course of the subsequent years today's Department of Comparative Physiology was formed of its part engaged in studies of physiological direction.

Also his students were fond of G é z a E n t z, for the kindness with which he strove to help them at all times. He gave proof of his helpfulness when, founded on his lectures, he published lecture notes as a manuscript in an extent over 1200 pages, illustrated with numerous figures, by which he helped his students in their studies. His activity as university professor was characterized by devotion to science, enthusiasm and generosity.

G é z a E n t z's scientific work in the field of biology covered a very wide range; he was mainly engaged in studies on protistology, limnology and general biology. His scientific work conducted as early as when he was assistant, is similarly worth of attention. This is also shown by the fact that his competition essay bearing the title "The organism of the Tintinnidae" was awarded of the Bugát-prize by the Hungarian Society of Natural Science in 1908, and that with his essay "About the river crabs of Hungary" he won the Margó-prize of the above Society in 1909. Founded on thorough studies of an abundant examination material and on the critical assessment of the vast and scattered literature on the subject he presented a detailed taxonomic and zoogeographic survey of the river crabs. In that period of his activity he dealt with fresh-water and marine Tintinnidae and Peridineae, as well as with the fresh-water *Gymnodinium* further, over and above these, with the plankton of Lake Balaton. It is partly the result of these researches that he presented in a lecture under the title: "The outline of the biology of Lake Balaton" at the 36th Itinerary Congress of Hungarian Physicians and Natural Scientists held in Veszprém in 1912. He emphasized that when judging the biology of the Lake, the shallow depth, the nature of the bottom, the high opacity of the water have to be taken into consideration. In his opinion the chemical composition and high seasonal fluctuation of the temperature of the water of the Lake are most important from a biological point of view. He also made mention of the conditions favourable for reed-grass, the moderate depth of the water, its transparency and at the same time of its abundance in plankton, which was important for feeding the rich stock of fish of the Lake.

In later years (1912–1929) he conducted examinations on the cytology and division of *Polytoma uvella*, as well as on the division shell and cystformation of *Ceratium hirundinella*. In the Netherlands he carried on research work on the morphology and biology of the Peridineae, on the morphology, variation and biology of the fresh-water Ceratia, on the Peridineae of Lake Balaton, on the structure and function of the membranules of the Tintinnidae, as well as on the flagella of the Peridineae in morphological and functional respect.

When discussing G é z a E n t z's further scientific work conducted in Tihany, it should be mentioned that the initiator of scientific researches of Lake Balaton was L a j o s L ó c z y, Sr., on whose motion the Board of the Hungarian Geographical Society set up the Balaton Committee in 1891. The zoological research was in charge of G é z a E n t z, Sr., who emphasized at the time that the biological study of Lake Balaton "could be accomplished with good results only in a well-equipped laboratory, situated on the shore of the Lake". Also L ó c z y (1921) was of the opinion that a biological station could gain significant experience for the knowledge of the living world of Lake Balaton and that — besides science — it would be of use also for the economic and practical life of the country.

The long-desired idea of a "laboratory" came true in some decades; first in the form of a research station of the Zoological Cabinet of the Hungarian National Museum at Révfülp in 1925, later as the First (Balaton) Department of the Hungarian Biological Research Institute of Tihany in 1927. Two years later G é z a E n t z who had taken part with his plankton-studies in the work of the Balaton Committee already as a young scientist, at the beginning of his career, was appointed head of the Department of the Biology of Lake Balaton. With his appointment the choice fell to the best, internationally acknowledged scientist who, on account of his wide intellectual horizon, of his excellent relations with foreign scientists and researchers, furthermore of his great command of languages could by right undertake the great and difficult task of organizing and directing the institution, and was so-to-say predestinated to this. Strongly attached to his profession, he did the work of managing and with great interest and zeal, and untiringly investigated the live world of Lake Balaton up to the last year of his life. He had wide knowledge in the field of biology, and was well-versed in the scientific branches of protistology, cytology, as well as ecology and limnology. It was in this period he published his work written together with L a j o s S o ó s: "Life in the sea", in 1931. The achievements of his research work of several decades on Lake Balaton, as well as the results obtained by the specialists of the Institute who conducted investigations in various fields were published by him in the work bearing the title "The life of Lake Balaton" in 1940, written together with his enthusiastic and zealous student and later collaborator O l g a S e b e s t y é n. This work of wide scope deals not only with the living world, it also covers the geographical, geological and hydrographic characteristics of Lake

Balaton as a biosphere and the physical and chemical properties of its water. In further chapters the work deals with the material turnover, the biotopes and the bars ("turzás") of the Lake in full detail. A separate chapter of the monograph is devoted to the changes to be observed in the life of the Lake. In connection with these researches the up-to-date rhythmic attitude of the chapter should be emphasized, which was being introduced also in Hungary. Viewed from this angle, the changes ensuing in the life of the Lake are discussed with regard to the seasonal and circadian rhythms, which means a tendency in advance of that time and also extends future hydrobiological trends. This chapter also deals with the changes taking place in the life of the Lake in consequence of human interference. Finally, the reader is given a general outline of the live world of the neighbourhood of Lake Balaton; at the same time attention is called to the necessity of a thorough biological research of this highly varied area. Based on the results of the studies on the life of Lake Balaton, the monograph affords a possibly full picture about its varied aspects on the one hand, and gives a programme for future research work on the other still actual for the solution of the problems presented by the Lake. May we mention that also a slightly revised Hungarian version of the monograph appeared in 1942 in book form with a view to propagate popular science, with the publishers of the Hungarian Society of Natural Science. So that the results of Balaton research could be made known to foreign specialists, also a revised and completed German version of the monograph was published in 1946. Géza Entz did not live to see the publication of the German edition; still, he followed the work of revision with vivid interest to the last year of his life. Closely connected with the said monograph is his work: "Quantitative studies on the bioeston of Lake Balaton" published in 1937, written in co-authorship with his collaborators József Kottász and Olga Sebestyén. Besides the questions of plankton research, he was also engaged in studying general problems referring to Lake Balaton. The results of his examinations conducted in this direction were reported in the work published jointly with Olga Sebestyén: "The variation in size, the probable age, the relation of the sexes to each other and to the thickness diameter of the shell of *Anodonta cygnea* (Unionidae)" (1933). Similarly connected with the monograph mentioned above is his major essay: "Studies on bars in Lake Balaton" (1942), written with his collaborators Olga Sebestyén and Mihály Szabó, in which he drew attention to the biological significance of the bars of organic origin, further to an important problem of the Lake: the connection between the occurrence of detritus and that of the bars. Géza Entz also took his share in the research of detail problems of Lake Balaton. He did research on the Unionidae living there (1932), on the Mollusca of Lake Balaton and its aquatic environment (1941), on the appearance and spreading of the *Dreissena* in Lake Balaton (1936) and on the biology of *Gobius marmoratus*. His study on the Mollusca of Lake Balaton and its environ-

ment is an example of how the Lake and its neighbourhood can be synthesized into a higher ecological unit. Only by G é z a E n t z could the extensive and valuable synthesis of the living world of Lake Balaton be accomplished, since he was passionately fond of the Lake and did his research in winter and summer alike with enthusiasm for several years.

In the course of his protistological research he could observe numerous phenomena which take place in the protoplasm of the living cell and refer to the properties and function of the protoplasm, cell nucleus or certain cell constituents (cilia, flagella, fibrilla), and to the growth or decay phenomena of the cell or of its parts. In his opinion based on his own research the properties of the protoplasm in their pure forms of appearance can best be observed in living organisms, in Protists; still, in the examination of the finer structure he could get as far as the limit of visibility by the few thousandfold magnification to be attained by the light microscope. Along with his father, G é z a E n t z, Sr., he recognized the significance of the finer structure of the protoplasm in the interpretation of the symptoms of cellular life. Their main topic in this direction was the investigation of the fundamental structure of the protoplasm, and they were the precursor of a scientific attitude reflecting this aspect. The significance of this trend of research has been increasing ever since: cell biology has evolved, the rapid development of which has been furthered, among others, by electron microscopy.

Over and above his work of education and scientific investigation, G é z a E n t z also took part in the work of organizing scientific research, in his capacity as head of the Biological Research Institute. When, besides his function as university professor, he took over the direction of the whole Institute of Tihany, he set it the aim of conducting biological research on Lake Balaton in general, and on the fresh-water organisms, — and that by a rather wide interpretation of the concept of biology. He also drew the problems of morphology, taxonomy, zoology, botany, bacteriology, embryology, physiology and ecology, etc. into the scope of the research to be conducted, and studied these questions in a way that besides some basic features of the Lake he also could clear up the general aspects of life. The studies and experiments conducted in the Institute on growth, regeneration and other subjects related with general biology and physiology were of this kind. As head of the whole Institute he also had the control and organization of the research work of the original Department of General Biology in his competence. The Department was engaged in studying various problems of physiology, pharmacodynamics and genetics, special topics of chemistry as well as in a study of the chemical, physical and other general characteristics of Lake Balaton. With readiness to sacrifice and great enthusiasm G é z a E n t z held this wide organizing and controlling work well in hand all the time. Thanks to his foreign relations already mentioned in this paper, there was a considerable number of foreign researchers who used to work in the Institute; the same persons every year. Later also their

collaborators returned there, which proves that the prominently directed Institute had achieved itself a worthy place in foreign scientific circles. Also numerous members of the Hungarian scientific institutions visited the Institute, which provided opportunity for them to meet Hungarian and foreign scholars of the various domains of natural science. G é z a E n t z was a very amiable and kind person. As a man of these fine human characteristics, he commanded the affection of his collaborators, as well as that of the Hungarian and foreign guests of the Institute.

He could take absorbed delight in the beauties of nature; his fine water-colours painted for his own pleasure with artistic feeling reflect this meditative attitude of his.

He was brought up in an ideal family circle, of which the effect was felt in his constitution to the end. His modesty, his behaviour toward his fellow-creatures, his sympathy and goodwill have their origin there. He loved his own family devotedly and cared for its members with a true heart. Deservedly was he granted one of the greatest joys: he could live to see the choice of career of his only son, B é l a E n t z, true to the traditions of the family.

Professor G é z a E n t z left us on February 21st, 1943, on account of a long and grave disease, which he endured with acquiescence and extraordinary patience. With his death the Institute of General Zoology of the University of Budapest, the Biological Research Institute of Tihany and the whole of Hungarian biology suffered a heavy and distressing loss.

I meet a sorrowful obligation, when I remember in a few lines my honoured predecessor, the eminent professor, great researcher and impassionate master of the knowledge of this country.