



TRIBUTE TO ZOFIA

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Fig. 1. Zofia Kielan in 1945, as a student at the University of Warsaw.

Zofia was born in 1925 within a short period between two world wars. She belonged to that generation of educated Polish people, which is passing away just now, in which there was instilled an enthusiastic atmosphere, reveling in the restoration of Polish Independence, lost for the whole nineteenth century. This atmosphere evoked in them a deep, intrinsic understanding of what the Homeland means and a readiness to defend it in case of danger. Unfolding events, beginning with the Nazi invasion of 1939, required them to back this readiness with action. During the Second World War Zofia helped carry her country's torch of freedom, going through underground education and secret military training. Eventually she took part as a military nurse of the Home Army (*Armia Krajowa* or AK) in the battles of the Warsaw Uprising (1944) against Hitler's troops. The experiences of the war left its survivors with the realization that everything may perish except education and what one may achieve by hard work. Working hard for the restoration of Poland's ruined scientific infrastructure, institutions and museum collections, all the while studying under difficult post-war conditions — that was

what Zofia did in the 1940s (Fig. 1).

Zofia's worldview was also shaped by major upheaval in political, social and ideological changes that occurred in decades preceding her birth. Traditional religious belief prevalent through the nineteenth was being ousted by a scientific view of the world, sometimes in a climate of revolt. This was the source of Zofia's enthusiastic belief in the explanatory power of science and the importance of education, and a starting point of her future scientific career. Her general interests in natural sciences were steered toward palaeontology by Professor Roman Kozłowski, a renowned graptolite specialist (the only Polish laureate of the Wollaston Medal of the Geological Society of London), and her future supervisor, whom she met at the clandestine Warsaw University courses that she attended.

In the months that have passed since Zofia's death, her scientific career and personal character have been frequently discussed and written about. Herein I give some afterthoughts in celebration of her great life.

To all except a handful of scholars and close colleagues, the most surprising thing about Zofia's research program is that she began as an invertebrate paleontologist. She first worked on trilobites (the subject of her PhD, awarded in 1953 and published the following year), then on the jaw apparatuses of polychaete worms from the Paleozoic of Poland (published in 1966). Still, the most spectacular of her achievements and her most significant scientific contributions were made in vertebrate paleontology, and in particular, early mammalian history. Her interest in this subject dated back decades, but it was only in the 1960s that she got a chance to study vertebrate fossils, namely, the exquisite Late Cretaceous mammals collected by the Polish-Mongolian Paleontological Expeditions to the Gobi Desert — expeditions of which she was the organizer and often the leader. Mesozoic mammalian history henceforth became the main subject of Zofia's studies. Fifty years of her research yielded not only a huge supply of basic information on comparative anatomy and systematics, but also important contributions to several key problems of mammalian evolution, such as the position and evolutionary history of multituberculates; the relationships and timing of divergence be-



Fig. 2. Zofia Kielan-Jaworowska during one of the Polish-Mongolian Expeditions.

tween monotremes and therians; the single versus multiple origin of the tribosphenic (multi-function) molar pattern and zoogeographical implications of this issue; as well as questions related to feeding, reproduction, and locomotion of early mammals. The early history of mammals, not well understood prior to Zofia's discoveries and studies, has become one of the best known parts of vertebrate phylogeny in recent times. Her contribution in this advance has been enormous: beyond the considerable volume of her own results, Kielan-Jaworowska stimulated further discoveries and ideas worldwide.

The Polish-Mongolian Expeditions were a massive undertaking, and Zofia oversaw all aspects of the program, from organization of field work (Fig. 2), to follow-up research on the fossils collected (by a team of colleagues Zofia appointed), to dissemination of results to the international scientific community through publication in a comprehensive monographic series of *Palaeontologia Polonica* — all this demonstrates Kielan-Jaworowska's extraordinary organizational abilities, her enormous energy, and her deep understanding of how science should work. She knew how to make the most of the fossils collected, through the process of meticulous, penetrating studies at

various levels of interpretation; and she demonstrated the highest editorial standards in publishing the results of the expeditions. Moreover, she established an extensive international and interdisciplinary network of scientific contacts and collaboration, aimed at unifying the information from a global perspective. Yet she never forgot the particular "Polish Science" that she enhanced and gave high standards. This was her peacetime patriotism, of which we knew, though she never mentioned it. In spite of that, her contacts with foreign colleagues, from both West and East, were friendly, cooperative and very often supportive.

Apart from over one hundred publications concerning early mammalian history, about half of them resulting from collaboration, Zofia co-authored and co-edited two extensive compendia on Mesozoic mammals, the first one in 1979. Beginning twenty years later, she undertook the massive work of updating and summarizing the enormously expanded knowledge that accumulated in the two decades that passed since the appearance of the first treatise. This second compendium, *Mammals from the Age of Dinosaurs* (2004), was far more ambitious in scope than the first and was co-authored with two American colleagues, Rich Cifelli and Zhe-Xi Luo. This acclaimed book remains exceptional in its coverage of the subject and is a legacy left by Zofia's generation for evolutionary biologists to come.

It is widely known that Zofia Kielan-Jaworowska's professional activities extended far beyond pure research. Apart from more than twenty years of academic administration as Director of the Institute of Paleobiology and Head of the Vertebrate Paleontology Department at the same organization, she had appointments as Alexander Agassiz Visiting Professor, Harvard University (1973–1974); Visiting Professor at the Muséum national d'Histoire naturelle, Paris (1982–1984); and Professor in the Department of Paleontology, University of Oslo (1986–1995). Zofia also was engaged in several exploration projects, organized and took parts in conferences, and edited papers and journals. The importance of her editorial work, notably as the Chief Editor (1997–2007) of *Acta Palaeontologica Polonica*, was substantial, and we all, her students and younger colleagues, are indebted to her for her critical work and help on our research projects and our manuscripts.

We also remember how much Zofia appreciated the critical importance of popularizing natural science for the education of the young. She somehow always found time for this kind of activity and published some 70 popular articles and several books for different audiences, ranging from school children to university students. Kielan-Jaworowska also curated several important museum exhibitions in various places, including Warsaw (1968, 1985), Chorzów (1975), and Oslo (1993). Recently she published two editions (in English and Polish), of her scientific autobiography, including an academic-level popularization of current knowledge on

early mammalian evolution. This work also serves as a source book on all the eminent paleomammalogists of the time, her collaborators and friends.

Zofia's achievements have been recognized by numerous honors and awards. Two academies, the Polish Academy of Sciences and the Norwegian Academy of Science and Letters, and numerous learned societies made her their member. Among her awards is the Prize of the Foundation for Polish Science (awarded 2005), regarded as the most prestigious Polish scientific award. But to her, one of the most precious honors was the Righteous Among Nations title, awarded to the Kielan family (Zofia included) by Yad Vashem Authority of Israel, for sheltering a Jewish girl during the Second World War — an act that was punishable by death.

Since the beginning of this century Zofia's visits to the Institute of Paleobiology in Warsaw became infrequent and she did not travel abroad. She stayed in her house, where she kept an office and her extensive scientific library, situated in the green suburban village of Konstancin, some 20 km from Warsaw. Here she lived with her husband and (next door) her son's family. She continued her work at the house, where she received her friends and collaborators from various parts of the world, and so it naturally became a virtual center of Polish vertebrate paleontology. In this place she passed through the tragedy of her husband's death in 2011. He, Professor Zbigniew Jaworowski, was a widely known scientist and radiologist; a brilliant, optimistic and helpful man, her best friend and companion for more than sixty years. It was only her scientific work that helped sustain her after this loss. At that time, she especially welcomed contact with her colleagues and friends at the Institute, whom she treated with warmth and tenderness, like members of her family. She continued to grace us, her colleagues, with her knowledge, friendliness, and her smile. In return, we shared with her our deep estimation, gratitude, and admiration for her personality and her major contributions to paleontology.

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