

Dr Amnon Friedberg – Obituary



Amnon Friedberg was born in Haifa, Israel, on September 18, 1945. Already as a child he showed a strong interest in nature, animals, and travel, exploring the Carmel Ridge with his friends or alone, and expanding his trips to other parts of the country as he grew older. His zoological interests were at that time focused on reptiles; as a schoolboy he already had a small collection of live local reptiles, mainly snakes. Little did he know at the time that he would dedicate the rest of his life to entomology.

Amnon started his formal studies in biology in 1965 towards a BSc degree in Tel Aviv University, where he spent his entire career. During his BSc studies (in 1968) he was hired by Prof. Jehoshua Kugler (1916–2007), the founder and first curator of the entomological collection in Tel Aviv University (now part of the Steinhardt Museum of Natural History, Tel Aviv University (SMNHTAU)), to collect tachinid flies (Tachinidae) for Kugler's taxonomic and faunistic research. Within a short time Amnon proved himself to be an extraordinarily successful collector and supplied Kugler with many new and rare species. Amnon's relationship with Kugler remained very close and warm through the years. During this period Amnon became the leader of a group of entomologists (Kugler's students) who revived the taxonomic study of insects in Israel through their intensive collecting, observations, and publications.

Amnon completed his MSc thesis on the fruit-flies (Tephritidae) of Israel in 1971 and his PhD dissertation on the Reproductive behavior and reproductive isolation in fruit-flies in 1978 under Kugler's supervision. Upon completion of his MSc degree, he joined Kugler for his first trip to East and South Africa (and indeed his first trip abroad), which lasted more than three months, in order to deepen his knowledge on the Tephritidae. They travelled through Ethiopia, Kenya, Uganda, and Tanzania in a small Volkswagen, and collected flies, predominantly Tephritidae and Tachinidae, establishing the basis for the outstanding exotic collection of Diptera at the SMNHTAU, which Amnon continued to develop throughout the years. During that trip, Amnon met the famous South-African tephritid taxonomist Hugh Kenneth Munro (1894–1986), who became his tutor in Afrotropical fruit flies. Amnon always attributed his later professional success to the time he worked with Munro and on Munro's collection.

In 1979–1980 Amnon accepted a post-doctoral position to work on the insect collections of the Smithsonian Institution, Washington DC, USA. These were productive years of intensive work, together with famous dipterists that resulted in

several important publications. His work there was never completed, however, as he was recalled to Israel in 1980 to accept the position of a researcher in Tel Aviv University and the curator of the insect collection, following Kugler's retirement, a position he fulfilled until his retirement in 2013. Under his leadership, the insect collection grew considerably thanks to intensive field collecting by Amnon himself, his students and technicians (20,000–50,000 specimens per year), the exchange of material with colleagues abroad, and the absorption of collections from other institutions.



Typical photos of Amnon in the field in Israel; Nimrod, 2012 (left), Deir Hajla, 2004 (right).

Between 1972–2016 Amnon made numerous collecting trips abroad, including a worldwide trip in 1993, visiting 64 countries, some of which several times. One of Amnon's most important principles was to use any opportunity for collecting in order to enrich the SMNHTAU collection and obtain representatives of as many taxa as possible. He collected in remote countries with unstudied faunas, as well as in numerous countries around Europe and the eastern USA whose insect faunas had been well studied. Most of his collecting efforts were concentrated in Sub-Saharan Africa, including Benin, Burundi, Cameroon, Ethiopia, Kenya, Madagascar, Malawi, Namibia, Nigeria, South Africa, Tanzania, Togo, Uganda and Zambia. He visited most of these countries more than once, and some (like Ethiopia and Kenya) were visited every few years. He also favored Southern Asia where he travelled to India and Thailand several times, carried out extensive collecting in Nepal, Taiwan, Vietnam, and the Philippines, and occasionally visited China, Hong Kong, Singapore, and Japan. In the Americas Amnon participated in expeditions to Peru, Bolivia, and the Lesser Antilles, and collected intensively in Canada, USA, Mexico, and Costa Rica. Amnon's visits to the Australasian Region included only occasional collecting in Hawaii and north-eastern Australia, but these were balanced by an 80-day expedition to Papua New Guinea in 2012-2013. Naturally, he was particularly interested in the fauna of the East Mediterranean region and collected intensively over the years throughout Israel. It is difficult, if not impossible, to name a place in the country where he did not collect, including about 20 trips to the Sinai Peninsula when it was under Israeli control and in later years. Amnon's usual approach to a collecting trip was to hire a car and drive from site to site, spending three days at most at a particular locality

in order to sample as wide a range of habitats as possible. One of his life rules was that “It is persistent collecting that makes the collection vital and active; no collecting will necessarily lead to degradation”.



Amnon with colleagues during collecting trips in Ethiopia 2005 (top left), Madagascar, 2007 (top right), Papua New Guinea, 2013 (bottom left) and Malawi 2010 (bottom right).

Amnon was an extraordinary insect collector. He collected mainly by sweeping with a large net, and was able to collect and mount up to 500 specimens per day. In his best years he collected 10,000–15,000 specimens a year. However, the quantity did not come at the expense of quality. At the end of each collecting day he dedicated long hours to pinning the freshly collected specimens, turning the process into a kind of art: specimens were pinned with extreme precision, directly or on double mounts, and arranged in the box in straight rows. Amnon devoted a lot of time to pinning even the tiniest of flies that are often ignored by other collectors. Another notable habit of his was to produce large series of any species, particularly of those he considered to be new or otherwise interesting. This often allowed him to base taxonomic descriptions

on diverse and better understood characters, generously share material with other colleagues and distribute paratype specimens to many other museums.



Pinning insects in Kenya, 2005 (left) and Costa Rica, 2010 (right).

Rearing insects from their host plants was another technique he used often, which provided invaluable information on host associations as well as undamaged specimens. He had an extensive botanical knowledge that enabled him to recognize many plant families and genera, which was critical for the study of plant-feeding flies. One of the things that made Amnon such an amazing collector was his broad knowledge and interest in flies in general; he was one of a handful of expert dipterists able to recognize most families and many genera in the field, and when recognizing he collected something rare or unique, he tried to figure out what it was doing so that he could collect more of it.



Scanning plants for tephritids. Israel, 2009 (left); Ethiopia, 2015 (right).

Amnon was a world-renowned taxonomist of Tephritidae, particularly of the Afrotropical Region. However, he had a very wide range of interests and a deep understanding of many other groups of Diptera, their taxonomy, phylogeny, life history and behavior. In addition to publications on the Tephritidae and their relatives he published on 25 other Diptera families. Most publications on non-Tephritoidea were papers on the Israeli fauna, and some were new taxa descriptions or revisions. In addition to his research on Diptera, Amnon participated in taxonomic, faunistic, and ecological studies and publications on other insect groups, including beetles (Apionidae, Carabidae, Chrysomelidae), bugs (Nabidae, Thaumastocoridae, Tingidae), homopterans (Dictyopharidae, Psylloidea), and hymenopterans (Formicidae), mainly together with his students and technicians.

However, Amnon's real love were fruit flies, and he devoted most of his time and efforts to studying their taxonomy and phylogeny. Nevertheless, he also paid much attention to studying their life history, particularly to host associations. He believed in integrating data on life history, behavior and taxonomy, and that the host associations of herbivorous insects are paramount to understanding their taxonomy and phylogeny. Consequently, he combined field collecting and observations with morphological and genetic studies in the laboratory, and many of his studies were dedicated to the behavior of flies (which is rather unusual for a typical taxonomist), in particular to courtship and mating trophallaxis. Amnon also had a deep interest in gall-inducing insects, which is manifested by several publications on Tephritidae and other flies.

Amnon has published numerous faunistic works but he often referred to such work as secondary, perceiving taxonomic revisions to be of greater importance. He revised numerous groups of fruit flies, leaving his footprint on a wide range of higher taxa and had more or less complete manuscripts for some groups which he did not manage to publish before he passed. Much more work remains to be done on numerous groups he collected and it is unclear who would be able to take over this huge task. Despite his focus on fly collecting, Amnon also collected intensively other insects of many orders, partly to enrich the SMNHTAU collection and promote knowledge about the relevant groups and partly as a generous favor for colleagues. He had many friends and colleagues around the world with whom he shared his knowledge, specimens and literature. Hundreds of insect taxa have been described based partly or entirely on material collected by him, and it is not surprising that 100 taxa (97 species and three genera) have been named in Amnon's honor to date.

During his 40-year career Amnon described 252 taxa, predominantly flies, and authored more than 150 scientific publications, including books, book chapters, catalogs, and abstracts. He was also involved in numerous agricultural and ecological projects, such as studies of the biology and control of the leaf-miner *Liriomyza trifolii* (Agromyzidae), a survey of cotton insect pests (published as a book, in Hebrew), taxonomic and biological studies on Drosophilidae, Agromyzidae and Chironomidae, life history, taxonomy, and control of bulb flies (Syrphidae), insect biodiversity on tamarisk, and climatic effects on insect populations. He was also a pioneer in forensic entomology in Israel, who contributed to several criminal investigations and trials and supervised two police officers in their MSc studies in this field.

From 1978 until his retirement in 2013, Amnon taught (together with Danny Simon) the "Insect Faunistics" course, to which he devoted much time and thought. The course was highly favored by students and has always been regarded as one of the highlights among courses offered in the George S. Wise Faculty of Life Sciences. Amnon supervised 20 MSc and PhD students, some of which pursued an academic career in taxonomy and ecology, while others became teachers, professional entomologists or biologists in government agencies and collection managers in the

SMNHTAU. As the curator of the insect collection, he also endorsed six colleagues – new repatriates from the former USSR and Romania – and helped them to acclimate in Israel in general and in the museum in particular, realizing the invaluable contribution such trained biologists would make to the entomological staff and seeking to ease their absorption in Israel. Most of these colleagues are now members of the entomological staff in the SMNHTAU.



Amnon with students during a field excursion in the insect faunistics course, 2008.



Staff of the entomology section in the Steinhardt Museum of Natural History, Tel Aviv University; 2019.

Amnon had an immense contribution to Israeli entomology. For years he served as chief editor of the Israel Journal of Entomology, and the journal persisted and flourished thanks to his dedication. In the 1980s, he participated in the publication of the Encyclopedia of the Fauna and Flora of Israel, edited by Kugler, for which he wrote many of the entries himself and coined many of the modern Hebrew names of insects. He was a member of the Flora and Fauna committee of the Israel Academy of Sciences and Humanities and of the committee for Zoological Terminology of the Academy of the Hebrew Language, which recently completed the list of Hebrew terminology for all insect orders and all Diptera families in Israel. These contributions and activities were recognized by an honorary membership in the Entomological Society of Israel in 2015.

Amnon was married to Pnina, who accompanied him devotedly on some of his trips, being an “innocent victim” of his entomological enthusiasm. Three species of flies were named in her honor, and Amnon’s daughters, Vered and Liat, were also immortalized in fly names.

Amnon’s premature death is a major blow to the entomological community in Israel, to the international community of dipterists and to his colleagues and friends in the SMNH in particular. His knowledge and expertise are irreplaceable but his legacy will stay with us forever.

This obituary is a shortened and revised version of Amnon’s biography, recently published in a special issue of the Israel Journal of Entomology on the occasion of Amnon’s 75th birthday (Friedman A.L.L. 2019, Dr. Amnon Freidberg – 75 years. *Israel Journal of Entomology*, 49(2): 1-40. DOI: 10.5281/zenodo.3890302).

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