Historical Note

BEYOND BOTANY: IN APPRECIATION OF THE LIFE AND CONTRIBUTIONS OF DINI EISIKOWITCH (1936 – 2022)

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Text—Professor Dan Eisikowitch (Dini), one of the greatest researchers in pollination and botany, has passed away (1936-2022). Dini died on 19 July, 2022 at the age of 86. He leaves behind his wife (Ruti), son (Shaul), daughter (Irit), and five grandchildren.

Dini grew up in Ramatayim, a few kilometres north of Tel Aviv and studied in a high school in nearby Herzliya. While in high school, he was a member of the 'Hashomer Hatzai', a patriotic Israeli youth movement that continues its social and educational activities around the world today. When he was recruited into the Israeli Defence Forces (IDF) he was stationed in a settlement group in Kibbutz Dan, in the Hula Valley, at the foot of Mount Hermon and the Golan Heights in northern Galilee. During his military service, he was a paratrooper and a medic. He also undertook training in the naval forces and the armoured forces in which he served as a reserve soldier in patrol units.

He completed his academic studies in the Department of Botany at the University of Tel Aviv. His M.A. thesis (1965) was on the "Pollination Ecology of *Ficus sycomorus*", and his Ph.D. thesis (1970) was on the "Pollination Ecology of Plants in the Seashore Areas of Israel". Both theses were written under the supervision of Professor Ya'akov Galil.

Dini's scientific output amounted to about a hundred publications spread over more than fifty years. His early publications included works on the pollination of sycamore fig trees, co-authored with Prof. Ya'akov Galil (Galil & Eisikowitch 1968 a,b,c,d;; Galil & Eisikowitch 1969,1970). Those research studies are recognized today as resounding innovations. In 2016, the IXth International Fig Symposium held in Montpellier, France, was dedicated to the "Fiftieth Anniversary of the First Publication of Ya'akov Galil and Dan Eisikowitch on *Ficus* Biology" with Dini present as the guest of honour. Although he was engaged in many other subjects, Dini did not neglect his first great love for *Ficus*, and one of his last articles (54 years after the publication of his first article, Eisikowitch et al. 2022). dealt with the interaction between the *Ficus* and wasps with special emphasis on the fig tree.

Dini was always the keen observer of nature, ecology, botany, flowers and pollinators. He thought deeply about what he saw. His visionary insights led him to thinking "outside the box", beyond the generally held knowledge and beliefs of his contemporaries. Dini showed much interest in the behaviour of bees and flower-visiting birds. His talents concerning animal behaviour were acquired under the guidance of the Nobel laureate (1973) Nikolaas Tinbergen with whom he studied at Oxford. That stamp of deep understanding of wildlife behaviour is evident in all his writings throughout the years in which he researched the mutual interrelationships between pollinators and flowers, both in agricultural fields and in nature.

Already in the 1980s, Dini began to develop his original and innovative ideas on biophysics in pollination with emphasis on the importance of electrostatic forces on pollen grains in the transfer from the stamens of the flower to the bodies of pollinators and thence to the stigmas of the flowers. That pioneering work in which he participated (Corbet et al. 1982) with colleagues from Cambridge, received a "cold shoulder" at first, but is considered today as a breakthrough study. Following that, together with his students and colleagues, Dini deepened the field and developed a machine for the pollination of dates and almonds based on the electrostatic forces of pollen grains (De Grandi-Hoffman et al. 1991,1992; Gan-Mor et al. 1995; Law et al. 2000; Vaknin et al. 2001 a,b 2003; Gan–Mor et al. 1995, 2003a,b, 2009). That series of studies exemplifies the interdisciplinary depth, breadth and inspirational methods used by Dini in his work: from a theoretical idea to morphological research on the flower and the pollinator, laboratory experiments, and field experiments, before practical work and innovations for the benefit of agriculture.

In the 1980s, Dini became interested in the complex interactions between the nectaries, stigmas, nectar, pollinia and pollination in the Asclepiadaceae, notably *Calotropis* and *Asclepias*. One of his last contributions provides insights into 35 years of lasting interest (Mishal and Eisikowitch (2022). Also in the mid-1980s, Dini spent time in Canada, again making novel contributions to the long-overlooked interrelationships between microbes and floral nectar. The studies revealed the hitherto unsuspected effects of the nectar-inhabiting yeast *Metschnikowia rekaufii* on suppressing effective pollination in milkweed (*Asclepias syriaca*) (Eisikowitch et al. 1987; Kevan et al. 1989; Eisikowitch et al., 1990 a,b). That work gave rise to the idea (now commercialized) of “apivectoring”, i.e. using pollinators for the dissemination of microbial biological control agents for the suppression of crop plant diseases and pests. At that same time, Dini provided insightful contributions to formalizing, with examples, the idea of cryptic dioecy in which it is difficult to discern the differences between flowers and their plants that are functionally female or male (Kevan et al. 1990).

Dini Eisikowitch (1936-2022)

Dini was particularly attentive to the problems of pollination for agricultural cultivation by honeybees. Many of his studies dealt both with the practical aspects of using honeybees as pollinators and their efficiency and with the biological aspects of the pollination process, especially with fruits of the Rosaceae family (Sapir et al. 2004; Schneider et al. 2001, 2002, 2004), avocado (Ish-Am & Eisikowitch 1990, 1991, 1993, 1998 a,b), melon (Orr & Eisikowitch 1988; Dag & Eisikowitch 1995,1999) and industrial crops such as cotton (Eisikowitch & Loper 1984) and canola (Kevan & Eisikowitch 1990).

His practical research contributed greatly to advancement in the branch of bee pollination services for agricultural cultivation, and it is no wonder that Dini was called "bee beloved" and the "father of pollination in Israeli agriculture". All that is in addition to his unique contribution to the identification of nectariferous plants and their cultivation – both for wildflowers and for horticultural plants (Eisikowitch & Masad 1980,1982; Eisikowitch & Reves 1983; Eisikowitch 1986; Lupo & Eisikowitch 1990 + numerous reports in Hebrew). Most of the plots for nectar plants (wild and native) scattered throughout Israel are the results of his research and personal assistance to beekeepers.

Dini was a modest man, generous to all those around him. He, with his friendly face and

twinkling eyes, found a way into the hearts of everyone through his kind nature and open-handedness without a shred of animus, bias, or competition. A teacher and colleague with wide-ranging views (not only in science), and all those who were lucky enough to be in his company, both as students or researchers, were truly fortunate as can be testified by all those who loved him, his students, friends and colleagues.

On a personal note, AD adds "I became acquainted with Dini in the early 1970s when I took part in a course on pollination conducted by Dini in Tel Aviv. There is no doubt that this course influenced my own career, and from then onwards we cooperated in the guidance of students, in research, in conferences, and in writing. In recent years we collaborated in writing a book "Pollination in an Israeli mirror" which is in press. Dini managed to deal with the proofs but unfortunately, he will not see it in print.

Also, on a personal note, PK adds that he had the pleasure to host Dini during his times in Canada and remembers many animated and scholarly conversations. His advice that "if you think you have found something new, you may not have read enough" still rings true. In April and May, 2015, I had the great privilege and pleasure of being shown Galilee and the Negev desert with Dini and Ruti.

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