

refractive index of 1.509. By contrast, the glass from a previous Thera eruption 16,000–17,000 years ago has a refractive index of 1.514, that from Nisyros (though similar chemically to that from Santorini) has an index of 1.502, that from Melos has an index of 1.505 and that from Yali has an index of 1.494. Composition without optical properties is apparently not suitable for the purpose of determining the source of tephra, although a combination of composition and refractive index should be slightly better than index alone.

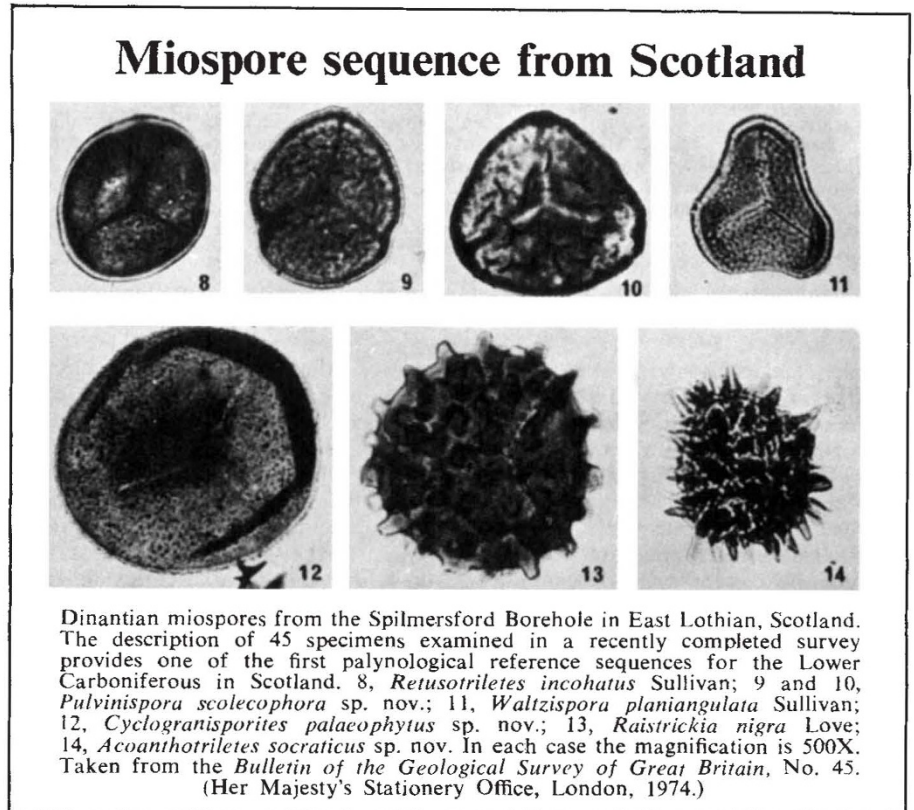
And tephra with glass of refractive index 1.509 is indeed found on Crete. Vitaliano and Vitaliano have now discovered the Minoan tephra in trace amounts in over 50% of soil samples collected along the eastern section of the north coast. Traces of the tephra are also found at various archaeological sites, though so far never in circumstances thought to represent undisturbed remnants of the original Minoan ash. A few particles of the 25,000-year-old Italian glass (index 1.52) were also found, but none from the 16,000-year-old glass of Thera.

Unfortunately, the quantities, locations and arrangements (with respect to archaeological artefacts) of the Minoan tephra are as yet insufficient to enable firm conclusions to be drawn about the relationship between the eruption and the destruction of Thera and Crete. But having proved the potential of their method, Vitaliano and Vitaliano tentatively conclude that "little or no time elapsed between the abandonment of Thera and the fall of tephra on eastern Crete". Thus the preliminary volcanological evidence suggests that the general destruction of Crete was not a direct result of the Santorini eruption.

The mating game

from our *Animal Ecology Correspondent*

THERE is no doubt that male and female animals play the mating game according to somewhat different rules. Males are usually much more showily dressed than females and are given to attention-seeking displays. Often these take place when there are no females in sight and so cannot be regarded as being for the benefit of the opposite sex. Darwin in 1871 (*Descent of Man and Selection in Relation to Sex*; Murray, London) stated that males competed among themselves for mates while females did not compete but exercised some choice in mate selection. In a thesis which received wide publicity in 1962, Wynne-Edwards stated that males displayed amongst themselves to assess their own density and decide which of them should breed and which should not (*Animal Dispersion in Relation to Social Behaviour*; Oliver



and Boyd, Edinburgh). The decisions are reached through competition for such prizes as a territory or a high rank in the social hierarchy. According to this thesis the fertilisation of ova is a secondary male role; the primary role is to ensure that the population is not allowed to exceed an optimum density above which habitat resources would be overstrained.

The late David Lack held firmly to the opinion that populations were kept below a level at which environmental damage would result by the action of predators or insect parasites (*Population Studies of Birds*; Clarendon Press, Oxford, 1966). In other words the size of the population is determined from without. Like Wynne-Edwards's, Lack's arguments are an extension of Nicholson's density-dependent control hypothesis (*J. anim. Ecol.*, 2, 132; 1933) inasmuch as there is a direct relationship between the severity of the controlling influence and the density of the population to be controlled. The displays which males put on apparently for other males, termed 'epideictic' by Wynne-Edwards, are seen by Lack to have nothing to do with a census but rather to have a sexual function in attracting females to males. In an early paper on black grouse (*Br. Birds*, 32, 290; 1939) he postulated that males displaying in groups attracted more hens than those displaying solitarily. He is thus critical of Wynne-Edwards's views that leks, traditional places for epideictic or nuptial displays, exist so that males can regulate the numbers of fe-

males fecundated and hence the population size.

Some long term studies of vertebrate leks are among the few studies of social behaviour in which observers have had the stamina to collect enough material to begin to assess these conflicting views.

The greater prairie chicken (*Tympanuchus cupido*) is a member of the grouse family which forms distinct leks. Robel and others (*Anim. Behav.*, 14, 328; 1966; *J. Wildl. Mgmt.*, 34, 306; 1970; *Auk*, 91, 75; 1970) have drawn attention to the fact that all matings take place at the lek. Between 1964 and 1969 there were few social upheavals at the chosen study leks and as a result 84% of the observed copulations were performed by dominant cocks. These also had the largest territories. This figure compares with 76% reported by Lumsden for dominant male sharp-tailed grouse *Res. rep. Ontario Dept Lands and Forests* No. 66, 1965 and 74% for dominant male sage grouse (Scott, *Auk*, 59, 477; 1942). During this long period of stability about 40 hens visited the lek each season of which on average, 32 were mated. In 1970 three, and in 1971 two dominant cocks were removed from the lek and with them went the stability of the lek. The number of social interactions observed each morning, formerly running at 23, rose sharply to 109 and the number of females mated fell to three and two. Social unrest amongst the males clearly reduced the number of young produced by limiting