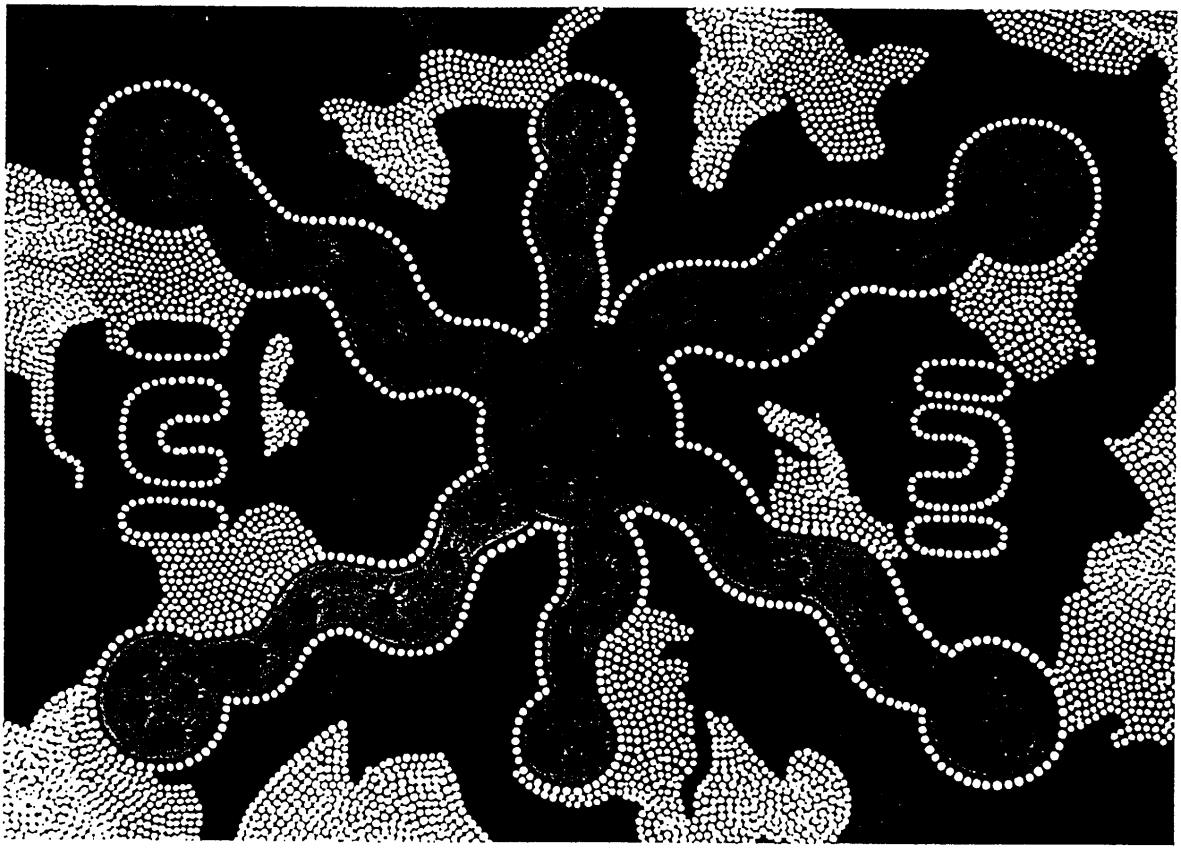
Social Insects
at the turn of the Millennium



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MODELING RED IMPORTED FIRE ANT (*Solenopsis invicta*) RANGE EXPANSION IN THE SOUTHERN UNITED STATES

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Vinson (1997) summarized range expansion scenarios for the red imported fire ant (*Solenopsis invicta*). We used our existing single colony growth model to assess the northern limits of fire ant expansion at different geographical locations in 12 southern states. The basic model is driven by daily soil temperature and answers the question: "can a colony reach maturity under a given set of average daily temperatures?" Our model: 1. Uses national weather data (NOAA) from 2090 stations as input. Uses average daily weather values of Airmin, Airmax and Precipitation for each Julian day to avoid the complexities connected with running 12 years of weather data over 2090 sites. 2. Converts max-min air temperature to max-min soil temperature at 10 cm. 3. Calculates colony growth, mortality and alate production (flight activity is governed by daily precipitation and peak abundance of alates occurs in May and June). 4. Assumes that production of one reproductive (alate) begins another colony, to sustain the fire ant population. 5. Estimates colony growth at each NOAA weather station. 6. Maps fire ant reproductive success by weather station (on an approximate 32 km grid).

Our modeled range expansion fits closely the -18^{0}C limit theorized by Hung and Vinson (1978) and supported by Francke *et al.* (1986). Also, because precipitation is needed to trigger alate flights, and precipitation is sparse in the southwestern U.S., our model probably does a poor job estimating range expansion to the southwest. We suspect that our model will work in locations where irrigation is common because irrigated tracts probably mimic areas where precipitation is ample.

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Hung, A.C.F., and S.B. Vinson. 1978. Factors affecting the distribution of fire ants in Texas (Myrmicinae: Formicidae). **Southw. Nat.** 23: 205-214.

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