

IN MEMORIAM

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IN MEMORIAM: CHARLES NOIROT'S LIFE IN ENTOMOLOGY (1922–2010)

Charles Noirot was born into modest circumstances in Paris in 1922 and died in Dijon in 2010. In the course of his long, fruitful and, to all appearances, happy life, he became a highly respected academic scientist, a much appreciated mentor to many, and a key figure in the post-War flowering of insect sociobiology.

From childhood, Noirot had a keen interest in natural history. As a youth he benefitted from the guidance of the entomologist Charles Pérez, but it was as a student at the University of Paris that he met his main influence, Pierre-Paul Grassé. At the age of 20, Noirot had come to a decision point between geology and zoology, and it was Grassé who directed his attention into the latter and more specifically into the rich territory of termite biology. The two worked closely and extensively together for many years. The core of their division of labor was that Grassé led in the formulation of the research program, while Noirot was the stronger experimenter.

Termites, like palms, are a signature group of tropical nature. They are hugely abundant, ecologically very impactful and often conspicuous at equatorial latitudes, yet have hardly any presence in the North Temperate Zone. It is not surprising, then, that termites were late in coming to the attention of western science. Knowing that Africa was the center of termite diversity, Noirot was eager to work there. After graduating, he went to work in the colonial Office for Overseas and Technical Research, basing himself in Abidjan, Ivory Coast (1946–1948). After his doctorate (1954), he joined a Grassé-led expedition through much of Central Africa and part of West Africa (1957–1958), and then returned to Abidjan for four years (1959–1963) as director of the Center for Higher Education, which later became the University of Abidjan. In 1964 he became Professor of Zoology at the University of Burgundy in Dijon, where he remained the rest of his life.

Noirot's Africa years were plainly his personal heroic period. Still, working conditions in Abidjan were a mixture of the frustrating and the fortunate. Especially at the Center for Higher Education, the buildings and infrastructure were hardly in place at first, and his administrative duties left little time for research. On the other hand, he had around him a rich variety of species and freedom to utilize as he wished what research time he had. He took the opportunity of long-term residence for studies of the nest development and colony cycle of various species, precisely the kinds of research beyond the reach of the short-term visitor to the tropics. In addition, he was able to look at the basic nesting biology of species that had never been studied.

Noirot undertook important studies in various areas of termite biology (with some attention to other arthropods). Of particular note are a) caste differentiation in higher termites, b) the comparative morphology of the gut, and c) the structure and working of higher-termite nests. He wrote the chapters on each of these in Krishna & Weesner's (1969–1970) review of termite biology.

As Bordereau (2011) has noted, the first two topics stand to form the core of Noirot's enduring legacy. At the time he began, there had been extensive studies of caste differentiation in a number of North American and European lower termites, but the much more diverse patterns of higher termites (Termitidae) were near-virgin territory, the literature virtually limited to a single short paper (Bathellier, 1925). Beginning in his early studies, Noirot (1949a, b, 1950) set the framework to make sense of caste patterns and their developmental pathways in higher termites.

He first undertook morphological studies of the gut as a search for new, phylogenetically informative characters (Noirot and Kovoov, 1958). The hindgut, and in particular the enteric valve, turned out to provide a wealth of good characters, but the morphology work also led into questions of the evolution of termite feeding habits. In large part due to this work, the diversity of these habits is now much better appreciated (Noirot, 1992). Following the move to Dijon, many of Noirot's morphological studies of the gut and tegumental glands were in collaboration with his wife, the histologist Cécile Noirot-Timotheé (e.g., Noirot-Timotheé and Noirot, 1965). Cécile's expertise in



Fig. 1. **A.** Alongside a nest mound of *Macrotermes* sp., Ivory Coast 1957. **B.** Members of the 1957 expedition through Central Africa at dinner. Left to right: soil scientist Philippe Boyer, team leader Pierre-Paul Grassé, Charles Noirot, photographer Jean Dragesco. **C.** Examining a termite colony fragment in a field lab, Central Africa 1957. **D.** Examining a lower-termite colony in an artificial nest, probably in Dijon in the 1960s.

electron microscopy and with protists added considerably to their collaborative research.

Noirot's relationship with his mentor calls for comment. The two men were very different creatures. Pierre-Paul Grassé (1895–1985) was very much a monument of science, and we can be quite sure that this was a conscious role. He was a man of grand projects: editor-in-chief of the 52-volume *Traité de Zoologie* (1950–1987), author of the comprehensive treatise *Termitologia* (1982–1986), one of the two founding fathers of the International Union for the Study of Social

Insects (IUSSI), organizer and president of international conferences, expounder on large scientific questions, and all-around center of attention.

In contrast, while by no means reclusive or narrow-viewed—e.g., he was very much a stalwart of the IUSSI, in which he served some key roles over the decades—Noirot had little interest in being a public figure. If he might seem overshadowed by Grassé during part of his life, he seemed quite indifferent to it. I once noted, for example, that all of their 26 collaborative papers were by

“Grassé & Noirot,” never the other way around, and asked if this always reflected their relative contributions. Noirot’s response amounted to “No, but it was customary at that time that the chief’s name came first,” as if it were unimportant. However, the commanding synthetic aspect of his many review articles and chapters now makes his leadership in today’s understanding of termite biology unmistakable.—*Christopher K. Starr, Department of Life Sciences, University of the West Indies, St Augustine, Trinidad & Tobago; mail: ckstarr@gmail.com*

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