

## The Internal Addition of an $\alpha$ -Keto-carbene to an Enone Double Bond

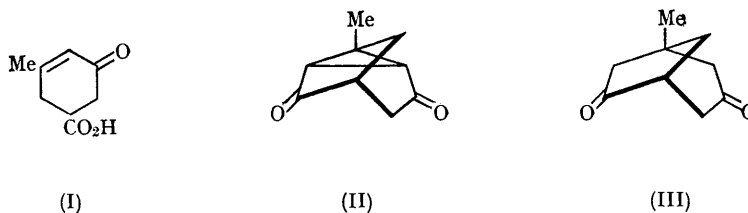
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MUCH work has been reported recently on the internal addition of  $\alpha$ -keto-carbenes, generated from diazo-ketones, to an isolated double bond, thereby giving bridged systems containing a cyclopropane ring.<sup>1</sup> We have been interested in extending this type of reaction to the particular case where the double bond is conjugated to a carbonyl group, since the resulting diacylcyclopropane should

hydrogenolyse easily and unambiguously, thus affording a convenient route to polyfunctional bridged-ring systems.

Treatment of the unsaturated keto-acid (I)<sup>2</sup> in benzene with oxalyl chloride in the presence of pyridine and then with diazomethane gave the derived diazo-ketone. Decomposition of the latter in boiling cyclohexane in presence of anhydrous



<sup>1</sup> G. Stork and J. Ficini, *J. Amer. Chem. Soc.*, 1961, **83**, 4678; W. V. E. Doering, E. T. Fossel, and R. L. Kaye, *Tetrahedron*, 1965, **21**, 25; S. Masamune, *J. Amer. Chem. Soc.*, 1964, **86**, 735; F. Medina and A. Manjerrez, *Tetrahedron*, 1964, **20**, 1807; S. Julia, M. Julia, and G. Linstrumelle, *Bull. Soc. chim. France*, 1964, 2693.

<sup>2</sup> D. S. Nolby and L. J. Nolby, *J. Org. Chem.*, 1961, **26**, 1732.

cupric sulphate gave in 38% yield the tricyclic diketone (II), m.p. 46.5–47°,  $\lambda_{\max}$  206 ( $\epsilon$  3800) and 290 m $\mu$  ( $\epsilon$  54) (in MeOH),  $\nu_{\max}$  1710 and 1740 cm.<sup>-1</sup> (in CCl<sub>4</sub>). Catalytic reduction of the latter (Pd/C in MeOH) proceeded rapidly and gave in

71% yield 1-methylbicyclo[3,2,1]octane-3,6-dione (III), m.p. 64°,  $\nu_{\max}$  1710 and 1745 cm.<sup>-1</sup> Analytical figures and n.m.r. spectra support these assignments.

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