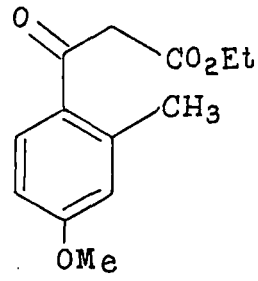
P R E F A C E

The thesis entitled "Synthetic Studies in Carbocyclic Systems" embodies the results of investigations carried out by the author during the period December 31, 1977 to August 14, 1981 in the organic chemical Laboratories of the University of North Bengal, Raja Rammohunpur, P.O. North Bengal University (Dist. Darjeeling) and consists of three parts. Part I incloses the results of experiments directed towards the synthesis of unsaturated medium ring compounds. In Part II are incorporated the results of studies on the attempted synthesis of the β-Ketoester (I) which was needed in connection with our projected synthesis of β-vetivone (2).



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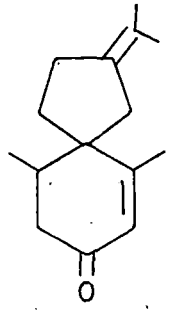

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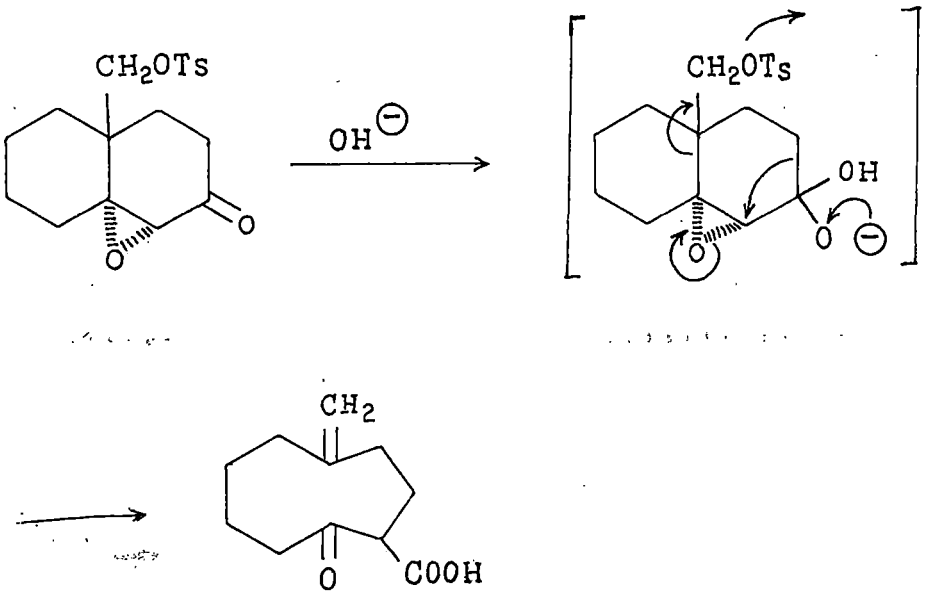
A new synthesis of nopinone (17) is described in Part III of the dissertation.

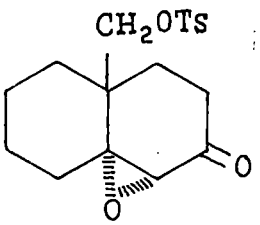
In view of the limitations of the existing methods (discussed in detail in the main body of the thesis) for the synthesis of medium ring compounds with one or more carbon - carbon multiple bonds, it was planned to develop a new method promising adaptability, selectivity and general usefulness for the synthesis of these systems.

Bicyclic gamma hydroxy tosylates are known to undergo fragmentation to give larger ring compounds. The study of these reactions has been well documented. alpha - beta - Epoxy ketones have been shown to undergo the Favorskii rearrangement. It was felt that a system incorporating the two structural features would undergo rearrangement - fragmentation as shown below:



The theoretical basis for such assumptions has been discussed in detail.

Two systems were investigated; (i) 4,10-epoxy-9-tosyloxy methyl-3-decalone and (ii) 3,9-epoxy-8-tosyloxy-methyl-2-hydrindone. In Part I of the thesis the results of these investigations have been discussed.



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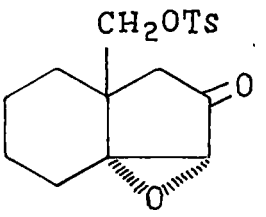
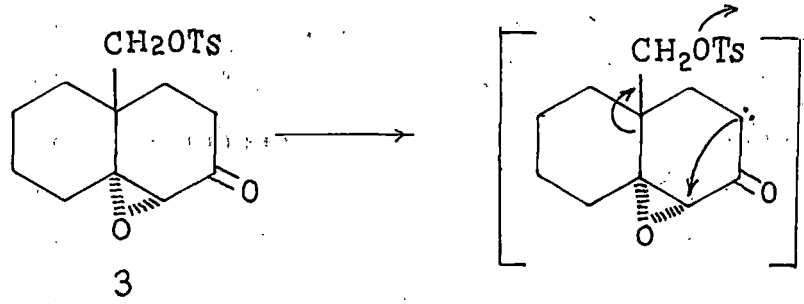


4

In view of the favourable enolization at C-3 of the decalone tosylate (3) [trans-fused] we had anticipated that the generated carbanion would attack the epoxide ring at C-5 and the released alkoxide would then cleave the central C-C bond with concomitant elimination of the tosyloxy group to give the unsaturated ketone (5) as one of the products. We expected that the cyclopropane derivative (5) would under



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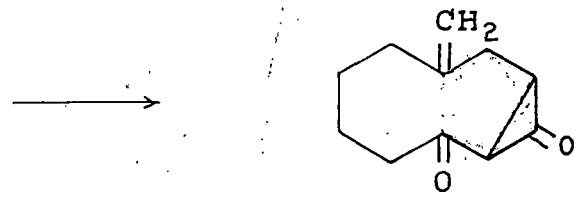

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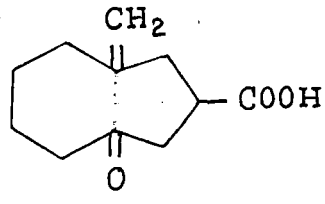
the influence of base would give the acids (6) and (7)



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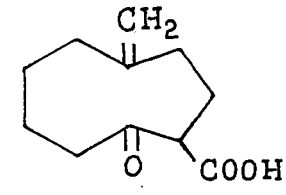
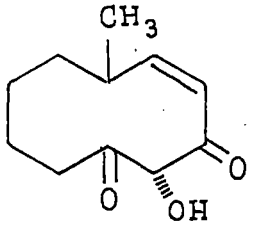


7

We also envisaged alternative modes of cleavage leading to different compounds. From the reaction mixture we could isolate a neutral compound and on the basis of mass, PMR, IR and UV spectral studies discussed in detail with in the main body of the thesis, we have tentatively assigned the structure (8) to this compound.



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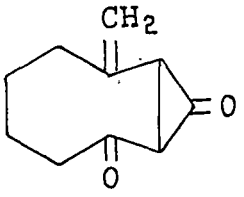
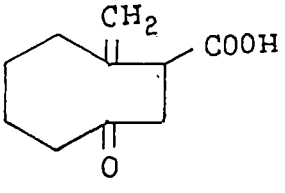
In the bicyclo nonane system we expected the initial formation of the compound (9) which in turn would



9

give the acids (10) and (11)



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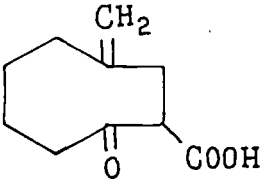

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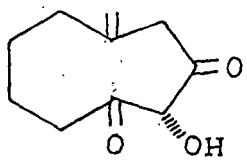
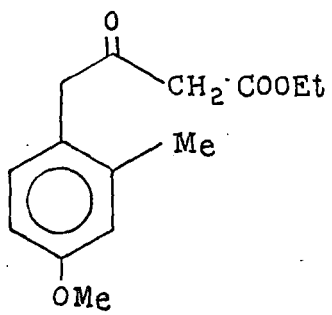
However from the reaction mixture we isolated a neutral compound and on the basis of Mass, PMR, IR and UV spectral studies discussed in the main body of the thesis we have tentatively assigned the structure (12) to the compound.



12

Due to the absence of GLC facilities in our laboratory, dependence on other laboratories for various spectral studies resulting in the decomposition of the extremely thermo labile compounds, we could not attempt the identification of any other compound present in the reaction mixture. However we are re-examining the reactions in detail and we hope to identify all the products.

In connection with a projected synthesis of β-vetivone in our laboratory we were in need of the β-ketoester (13). It was planned to synthesise this compound by



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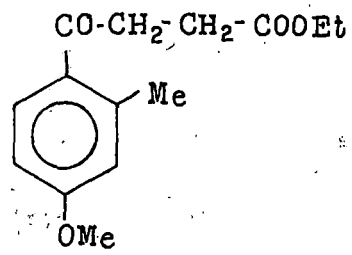
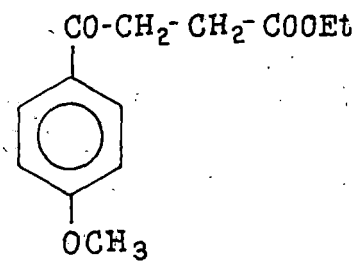
1,2 transposition of the carbonyl group in (14) which could be obtained by Friedel-Crafts succinolylation of m-cresol methyl ether. However before attempting the reaction with compound (14),



14

we wanted to standardise the procedure using a simpler system. Anisoyl propionic acid (15) was chosen as the model compound.



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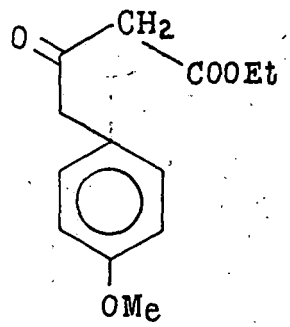
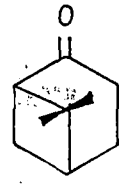
Oximination of the compound followed by modified Wolff-Kishner reduction was expected to give the oxime of the β- ketoester (16)



16

However we found that the oximino compound which was formed was extremely labile and moisture sensitive. Alternative approaches to this β-ketoester were examined and our efforts culminated in a successful synthesis of the desired compound. These results have been discussed in the Part II of the thesis. However, in view of an entirely different approach later planned, this approach was not pursued further.

In the III part of the thesis, we have described a new synthesis of nopinone (17) making use of intramolecular



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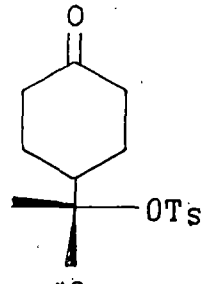
elimination of the tosyloxy group from 4-Isopropyl-7-tosyloxy-cyclohexanone (18).



18

The reason for choosing the Key intermediate has been discussed in detail. As the compound had been formerly converted to β- and α- pinenes which in turn have been converted to a number of mono terpenes, our synthesis of nopinone (taken with the other reported synthesis in the literature) may be considered as a total synthesis of all these compounds.