experiment, recrystallization of the original mixture from chloroform–ethyl acetate at room temperature yielded the desired syn isomer **7** specifically. The contents of the mother liquor which is rich in anti isomer **6** were converted easily into the equilibrium mixture on heating in ethanol.

Regiospecific Beckmann rearrangement followed by reketallization[21] was achieved with each isomer to give the pure regioisomers, 4-aza-**8** (mp 230–232 °C; δ ($CDCl_3$) 2.95–3.35 (N-CH_2)) and 3-aza-ϵ-lactams **9** (mp 242–244 °C; δ ($CDCl_3$) 2.65–2.95 (one hydrogen of N-CH_2, another overlapped with the ethylenedioxy hydrogen signal)). The assignment of these structures was also based on the remarkable differences between the two NMR spectra.[6]

Reduction of **9** with lithium aluminum hydride and subsequent hydrolysis afforded the amino ketone **10** (mp 213–215 °C). The enol acetate **11** (mp 139–141 °C) prepared from **10** was oxidized by lead tetracetate to give an acetoxy ketone **12** (oil; δ ($CDCl_3$) 4.90 (t, J = 9.0 Hz, 16α-H)). The configuration of the 16α-hydrogen was determined by the comparison of its NMR spectrum with those of 3β,16β-diacetoxy-5-androsten-17-one[22] (δ ($CDCl_3$) 4.99 (t, J = 9.5 Hz, 16α-H)) and 3β,16α-diacetoxy-5α-androstan-17-one[23] (δ ($CDCl_3$) 5.45 (d.d, J = 9.0, 2.0 Hz, 16β-H)). This acetoxy ketone **12** was a common key intermediate of the two alkaloids.

Firstly we converted **12** into cycloneosamandione **16** which seemed to be indispensable in our efforts to confirm the structure of cycloneosamandaridine **20.** Reduction of **12** with sodium borohydride and methanesulfonylation afforded the mesylate **13** (oil) which was immediately subjected to an elimination reaction to give the 16-oxo derivative **14** (oil; IR ($CHCl_3$) 1738 (C=O)). Mild oxidation of **14** with an equimolar amount of Jones reagent afforded an aldehyde **15** (oil; IR ($CHCl_3$) 2770 (CHO)). The conversion of **15** to the final product, which involves protection of the carbonyl groups, cleavage of the *N*-acetyl group, and removal of the protecting groups, was accomplished successively to give cycloneosamandione **16** (mp 120–122 °C; natural[7] mp 118–119 °C). The IR spectrum was superimposable with that of the natural product.[7]

Secondly, we aimed to synthesize cycloneosamandaridine **20.** Reformatsky reaction of **12** followed by reacetylation and dehydration was achieved to give an unsaturated carboxylate **17** (oil; δ ($CDCl_3$) 5.98 (t.d, J = 8.0, 1.8 Hz, 16α-H), 5.62 (d, J = 1.8 Hz, C=CH)). Catalytic hydrogenation of **17** and subsequent hydrolysis and cyclization afforded a γ-lactone **18** (mp 245–246 °C; IR (KBr) 3240 (OH), 1772 (γ-lactone); δ ($CDCl_3$) 4.90 (m, 16α-H)). The β-cis-configuration of the γ-lactone ring was confirmed by the chemical shift of the 16α-hydrogen which was fully compatible with that of our model compound, 3β-acetoxy-16β-hydroxy-5α-pregnan-21-oic acid γ-lactone (mp 215–217 °C; δ ($CDCl_3$) 4.88 (m, 16α-H)).[24]

Jones oxidation of **18** afforded an aldehyde **19** (oil; δ ($CDCl_3$) 9.70 and 9.75 (two s, CHO)).[25] Successive protection of the formyl group, deacetylation, hydrolysis, and recyclization of the γ-lactone gave a final product **20** (mp 270–272 °C; MS 345 (M^+, 15%), 330 ($M^+ - 15$, 32%), 316 ($M^+ - 29$, base peak); δ ($CDCl_3$) 0.79 (s, CH_3), 4.90 (s, 19-H), 4.95 (m, 16α-H), 7.10 (b, OH); IR (KBr) 3400 (OH), 1771 (γ-lactone)).

The spectral data of our synthetic specimen were consistent with the assigned structure **20.** However, it was not identical with the natural product (mp 281–283 °C).[11] The characteristic pattern of mass fragmentation of our sample clearly showed the preferential elimination of CHO from the original carbinol amine structure, while in the spectrum of the natural product it is distinctly absent.[11] The mass spectrum of the synthetic cycloneosamandione **16** revealed also an $M^+ - 29$ peak of 23% intensity. Furthermore, the natural cycloneosamandaridine showed an $M^+ - 1$ peak rather than the molecular peak, while **20** exhibited the molecular peak and no $M^+ - 1$ peak.

From the data described above we have decided that the structure of cycloneosamandaridine is not **20.** Although a true structure is not known, we suppose that the most probable one might involve a 3,6-cyclic carbinol amine ring system.

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A Totally Synthetic Bilayer Membrane

Sir:

We wish to report for the first time the formation of biomembrane-like bilayer structures from a simple organic compound.

Didodecyldimethylammonium bromide (Eastman) was recrystallized twice from ethyl acetate, mp 55–56 °C, and suspended in deionized water. A clear solution (10 mM) was obtained by sonication (Bransonic 12 ultrasonicator, water-bath type) for 4 h at 50 °C. A few drops of this solution was applied to a 150-mesh copper grid coated with a carbon film, which was then dried in a desiccator. A 2% aqueous solution of uranyl acetate was applied in a similar way.

An electron micrograph (Hitachi, Model H-500) of this sample is shown in Figure 1. Spheric objects with diameters of 300–500 Å can be clearly seen. This picture is indistinguishable from that of dipalmitoyllecithin vesicles reported, for example, by Sheetz and Chan.[1] When the sonication pro-

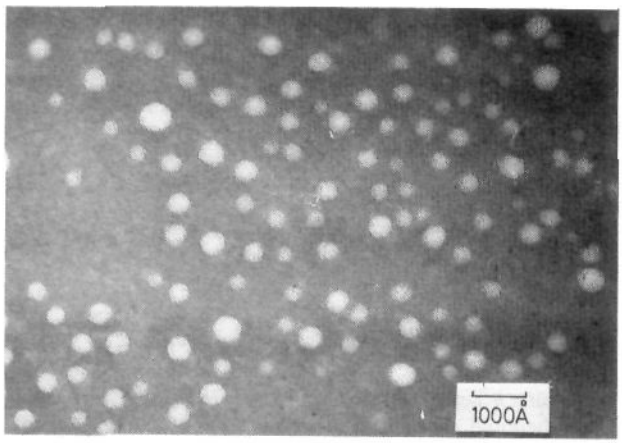

Figure 1. Electron micrograph of didodecyldimethylammonium bromide vesicles. (135 000 ×). The sample solution was sonicated in the absence of uranyl acetate.

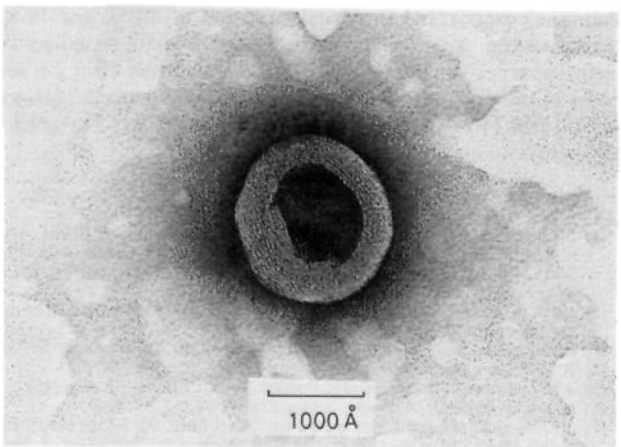

Figure 2. Electron micrograph of didodecyldimethylammonium bromide vesicles. (240 000 ×). The sample solution was sonicated in the presence of uranyl acetate.

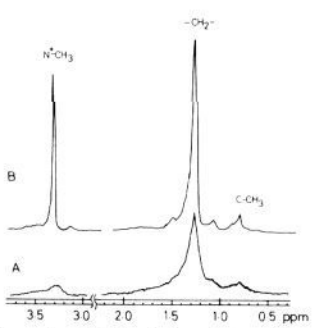

Figure 3. ^{1}H NMR spectra. D_2O solution. Internal standard, sodium 2,2-dimethyl-2-silapentanesulfonate (DSS): A, didodecyldimethylammonium bromide, 10 mM; B, hexadecyltrimethylammonium bromide, 10 mM.

cedure was omitted, the lamellar structure was observed instead of vesicles. Also, the same aqueous solution of didodecyldimethylammonium bromide was mixed with an equal amount of the uranyl acetate solution, sonicated for 10–15 min and applied to a copper grid. An electron micrograph of this sample indicates the presence of multilayered vesicles (diameter, 1000–2000 Å) which contain uranyl acetate in the interior region (Figure 2). The thickness of the layer is about 40 Å both in the lamellar structure and in the multi-layered vesicle.

The light scattering experiment (FICA, Model 4200) with a well-sonicated solution of the ammonium salt indicated the molecular weight of the vesicle to be ca. 700 000. Figure 3 shows a ^{1}H NMR spectrum (D_2O solution) of the ammonium salt obtained at the ambient temperature, in comparison with that of hexadecyltrimethylammonium bromide. The methyl and methylene proton peaks of the former compound are considerably more broadened than those of the latter which exist as micelles at the concentration range employed.

These results suggest that didodecyldimethylammonium bromide aggregates extensively in aqueous solutions into stable bilayer structures which further form vesicles and lamellae. The aggregation in water of ammonium compounds with two long-chain alkyl groups has been known for some time. However, the aggregate structure was never discussed[2] or was considered simply liquid-crystalline.[3]

The present finding is the first example of the totally synthetic bilayer membrane, and, apart from its relevance to the physical chemistry of biomembranes, this system will be used for preparing well-defined molecular organizations which possess various functions. The formation of the bilayer structure from a variety of related compounds and their physicochemical characterization will be the subject of later publications.

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Reactions in Dry Media. A Simple Conversion of Nitro Groups into Carbonyls

Sir:

Silica gel as a reaction medium is of great advantage when the use of organic solvents is undesirable, as in the case of ozonation reactions. Dry reactions on silica gel[1] are often neater and easier to perform than solution reactions. We have recently used such dry ozonations to oxidize amines to nitro compounds.[1d]

We report on the utilization of silica gel both as a reaction medium and a reagent to convert nitro compounds to ketones and aldehydes. This nitro to carbonyl group conversion is well known and of considerable synthetic value. It has previously been accomplished by acid catalyzed hydrolysis of nitronate salts—the Nef reaction.[2] This reaction has several synthetic drawbacks, the most noticeable of which being the required strong acid conditions. In order to overcome these drawbacks, several roundabout methods were devised during the last 2 decades, using either oxidizing[3-6] or reducing[7-9] agents.

Our approach reverts to the original Nef reaction, consisting of a simple, one step procedure which is both effective and mild. It involves embedding the nitro compound into activated basic silica gel and elution of the resulting carbonyl derivative.

The basic silica gel[10] is readily prepared by mixing chromatographic grade silica gel with a methanolic solution of sodium methoxide, followed by evaporation to dryness and heating at 400 °C for several hours. The resulting dry powder (contining 0.5 equiv of sodium per 1 kg of silica gel) can be