

allylic halide, was also discussed. It was suggested that a metal aquo-complex was transformed into a hydroxo-complex and CO was then inserted into the M-OH bond. This suggestion is consistent with the ideas of B. R. James, M. Kastner and G. L. Rempel on similar acetylene insertions into Rh-OH bonds.

H. Werner, in his plenary lecture, described the synthesis of borazole-metal complexes $(B_3N_3Me_6)M(CO)_3$ (M=Cr, Mo, and W). In dioxane, a binuclear compound $(CO)_3Cr(\text{dioxane})_3Cr(CO)_3$ was isolated and provides the most convenient starting material for the borazole-chromium complex. The borazole-to-metal bond is much more labile than the benzene-to-metal bond in $(C_6H_6)M(CO)_3$, and is cleaved by σ as well as by π donors. The kinetics and mechanisms of some of the reactions, as well as of the carbene complexes $(CO)_5M(OCH)_3R$ (M=Cr, Mo, or W; R=CH₃ or Ph), were also described.

In another lecture, F. G. A. Stone reviewed his recent work on metal carbonyls, and especially on the polynuclear carbonyls of Ru, Os, Rh and Ir. He described a number of new mixed metal clusters, such as $Fe_2Ru(CO)_{12}$, $H_2Ru_3Fe(CO)_{13}$ and also mentioned new compounds with Group IVB metal-transition metal bonds, such as $Bu_3Ge(Me_3Si)Ru(CO)_4$.

M. F. Lappert and J. Lynch reported on perfluorophenyl-silicon compounds, obtained from Ph_FLi and X_nSiCl_{4-n} [with subsequent removal of the H, OR or NR_2 protecting group(s) X_n]. Ph_F groups on Si cause an enhanced nucleophilic susceptibility at Si but a decreased reactivity to electrophilic attack at a neighbouring site. ^{19}F and 1H nuclear magnetic resonance and infra-red spectra suggest that Ph_F is somewhat less electronegative than Br and that Si can accept π -electron density from Ph_F . The use of nmr spectra to distinguish between σ and π effects, and to measure their importance, featured also in the papers by R. Murray and J. Walker [on substituted triphenylphosphine metal complexes: ^{19}F shifts for m -F give σ effects and (m -F minus p -F) estimates π effects] and by R. J. Mawby and R. V. Souter [on π - CH_3 - $C_5H_4Mo(CO)_3X$, wherein the difference in chemical shifts between the A- and B-protons of the C_5H_4 group was regarded as a measure of the electronegativity of X].

Aspects of Organic Synthesis

from a Correspondent

IN his opening lecture at the symposium at the annual meeting of the Chemical Society in Dublin last week, G. Büchi discussed approaches to the indole alkaloids vincristine and vinblastine. The synthesis of the tetracyclic indole intermediate, vindolene, was described. A key step in it is the condensation of an isoquinuclidine residue with indole acetic acid. After F. J. McQuillan had outlined the routes to 3-hydroxy-4-hydroxymethyl-4,10-dimethyloctalins, G. H. Whitham described the formation of alkenes from 2-phenyl-1,3-dioxolanes on treatment with alkyl or aryl lithium reagents. The wider implications of this valuable route to *trans*-cycloolefins were considered in terms of the Hoffmann-Woodward rules as applied to cycloelimination reactions. An interesting stereochemical study of a series of tricyclic lactones based on analysis of proton nuclear magnetic resonance line broadening was then described by D. M. S. Wheeler as part of a programme designed to synthesize diterpenoid acids.

V. Prelog gave the Robert Robinson lecture. He discussed the application of group theory to complex organic structures and the stereochemical implications arising from such a treatment. R. A. Raphael described novel methods for synthesizing bridged ring compounds, in particular of the bicyclo-3,3,1-nonane series and of related natural products.

In a session devoted to protective techniques in organic synthesis, F. Cramer reviewed the methods available for blocking hydroxyl functions in chemical polynucleotide synthesis, in particular by groups such as β -cyanoethyl, trichloroethyl and benzyl in conjunction with polystyrene support, and D. S. Kemp described the use of 7-hydroxy-2-ethyl-benzisoxazolium salts in the protection of peptide acids. The use of a trialkylsilyl group to protect terminal acetylenes in Glaser and Cadiot-Chodkiewicz oxidative coupling reactions was outlined by D. R. M. Walton. Novel aspects of cyclobutadiene chemistry were described by R. Pettit. Of particular interest was the rationalization in terms of orbital symmetry of products arising from dimerization of liberated benzocyclobutadiene depending on the oxidizing metal cation. The increasing importance of coupling and displacement reactions promoted by copper catalysts was emphasized by R. G. R. Bacon. Routes to benzophenones by means of Fries rearrangements of depsides and the biosynthesis of xanthenes from hydroxylated benzophenones were described in subsequent communications.

Observations of Whistlers on OGO I

from our Magnetosphere Correspondent

THE first and very successful observations of whistlers far out in the magnetosphere are reported by R. L. Smith and J. J. Angerami (*J. Geophys. Res.*, **73**, 1; 1968). The special purpose telemetry channel on OGO I provided high time resolution over the whole of the broad band, 0.3-12.5 kHz, of the Stanford VLF experiments, and timing errors were only about 10 ms. This enabled calculations to be made of propagation times, using recordings from ground stations in both hemispheres near the meridian of the satellite. Previous interpretation of whistlers observed at the ground suggested that they were propagated in ducts, which were field-aligned regions of slightly enhanced electron density. Even without ducts, the direction of group propagation for the whistler mode is much closer to the field direction than the wave normal is, but strict guidance requires ducts. On OGO I, ducted whistlers were observed with the predicted properties, and from them estimates of the width and spacing of the ducts were obtained. Information about the electron density in the magnetosphere could be deduced as well as an indication of the distortion of the magnetic field. In addition, non-ducted whistlers were observed, with properties which agreed well with computations by Kimura (*Radio Sci.*, **1** (new series), 269; 1966) of ray paths in a smooth magnetosphere.

The effect of protons as well as electrons is important for the non-ducted ray paths. Propagation across the field is possible below the lower hybrid frequency, which is approximately the geometric mean of the electron and proton cyclotron frequencies, but depends on the electron density as well. Kimura's computations show that the ray paths follow the field lines quite closely until the lower hybrid frequency approaches