as a mixture of diastereoisomers in $25 \%$ yield ( $80 \%$ based on 9 recovered in the acid fraction).

Attempts to convert the 3-methyl-3-(alkylthio)oxindole 10 to 11 with lithium aluminum hydride ${ }^{14,19}$ proved unsuccessful. Indeed, the procedure was sluggish or completely ineffective in several model studies. Borane reduction of 3 -substituted oxindoles has been reported to afford indolines. ${ }^{20}$ However, with the additional 3-alkylthio substituent, we observed essentially quantitative conversion to the 3-substituted indoles on several model oxindoles with $\mathrm{BH}_{3} \cdot \mathrm{SMe}_{2}$. Treatment of $\mathbf{1 0}$ with an excess of $\mathrm{BH}_{3} \cdot \mathrm{SMe}_{2}$ at room temperature for 24 h likewise afforded 11 in $95 \%$ yield. Normally, the entire procedure $9 \rightarrow 11$ was accomplished without isolation of intermediates in a 2 -pot, 24 -h process.

Our initial efforts in the synthesis of 13 involved the methyl ether as the phenol protecting group (e.g., 5, $\mathrm{R}=\mathrm{CH}_{3}$ ). After numerous failures with acidic-type reagents ${ }^{21}$ to deprotect 11 to 12, we found that mercaptide anions ${ }^{22}$ accomplished this transformation in $40-60 \%$ yields. However, the yields decreased on

[^0]scaleup. Therefore, the synthesis was repeated with benzyl ether ( $5, \mathrm{R}=\mathrm{CH}_{2} \mathrm{Ph}$ ), ${ }^{23}$ which was readily removed to give $12^{9}[90 \%$; NMR (acetone- $d_{6}$ ) $\delta 7.8(\mathrm{br} \mathrm{s}, 1 \mathrm{H}), 7.03(\mathrm{~s}, 1 \mathrm{H}), 6.83(\mathrm{~s}, 1 \mathrm{H})$, 4.25-3.25 (m, 5H), $2.86(\mathrm{~s}, 3 \mathrm{H}), 2.36(\mathrm{~s}, 3 \mathrm{H})$ ]. The methylsulfonyl group on anilines can be cleaved with sodium (2methoxyethoxy)aluminum hydride. ${ }^{24}$ This procedure was successful with 6 and should allow for the introduction of other groups on the indoline nitrogen at this, or later, juncture.

The concept of forming bond a as an entry to the cyclopropylspirocyclohexadiene moiety was validated by first converting the alcohol to the bromide ${ }^{25}$ followed by exposure to a tertiary amine to give 13. This can be accomplished in one pot in $70 \%$ yield. The structure of $\mathbf{1 3}$ was based on ${ }^{1} \mathrm{H}$ NMR, IR, UV, MS, ${ }^{26}$ and single-crystal X-ray analysis. ${ }^{29}$
(24) Gold, E. H.; Babad, E. J. Org. Chem. 1972, 37, 2208-2210.
(25) The bromide derivative of 12 was isolated by rapid preparative TLC and structure determined by ${ }^{1} \mathrm{H}$ NMR and MS (positive Beilstein). On prolonged contact with silica gel it is converted to 13 .
$(26){ }^{1} \mathrm{H}$ NMR ( $\left.\mathrm{CDCl}_{3}, 200 \mathrm{MHz}\right) \delta 9.5(\mathrm{br} \mathrm{s}, 1 \mathrm{H}), 6.83\left(\mathrm{dd}, \mathrm{H}_{\mathrm{a}}\right), 6.34$ $\left(\mathrm{s}, \mathrm{H}_{\mathrm{b}}\right), 4.10\left(\mathrm{~d}, \mathrm{H}_{\mathrm{c}}\right), 3.93\left(\mathrm{dd}, \mathrm{H}_{\mathrm{d}}\right), 3.04(\mathrm{~s}, 3 \mathrm{H}), 2.93\left(\mathrm{~m}, \mathrm{H}_{\mathrm{e}}\right), 2.00(\mathrm{~d}, 3$ H), $1.97\left(\mathrm{dd}, \mathrm{H}_{\mathrm{f}}\right), 1.37\left(\mathrm{dd}, \mathrm{H}_{\mathrm{g}}\right) ; J_{\mathrm{c}, \mathrm{e}}=0.0, J_{\mathrm{c}, \mathrm{d}}=9.7, J_{\mathrm{d}, \mathrm{e}}=4.7, J_{\mathrm{e}, \mathrm{f}}=7.7$, $J_{\mathrm{e}, \mathrm{g}}=4.4, J_{\mathrm{f}, \mathrm{g}}=4.4, J_{\mathrm{NH}, \mathrm{a}}=2.0, J_{\mathrm{a}, \mathrm{CH}} \leq 1.0 \mathrm{~Hz}$ is consistent with ${ }^{1} \mathrm{H} \mathrm{NMR}$ of $\mathrm{CC}-1065^{2}$ and 3 -azabicyclo 3.1 .0$]$ hexane. ${ }^{27}$ IR $\left(\mathrm{CHCl}_{3}\right)^{28} 3450$, $3400-3100(\mathrm{NH}, \mathrm{OH}), 1620(\mathrm{CO}), 1360,1160 \mathrm{~cm}^{-1}\left(\mathrm{SO}_{2}\right)$. UV $(\mathrm{MeOH})^{2}$ $\lambda 224\left(\epsilon 3 \times 10^{4}\right), 272\left(4.8 \times 10^{4}\right) 338\left(3 \times 10^{4}\right)$. MS, $m / e$ calcd for $\mathrm{C}_{13} \mathrm{~N}_{14} \mathrm{~N}_{2} \mathrm{O}_{3} \mathrm{~S}: 278.0725$. Found: 278.0725.
(27) Wendisch, D.; Naegele, W. Org. Magn. Reson. 1970, 2, 619-624.
(28) Marx, J. N.; Argyle, J. C.; Norman, L. R. J. Am. Chem. Soc. 1974, 96, 2121. See also: Gramlich, W.; Plieninger, H. Helv. Chim. Acta 1979, 112, 1573-1582.
(29) $R=0.079$ on 2322 reflections: Chidester, C. G., unpublished results, Upjohn Co., 1981. Full details will be disclosed later.

## Additions and Corrections

Photochemistry of Cis-Fused Bicyclo[4.n.0]-2,4-dienes. Ground State Conformational Control [J. Am. Chem. Soc. 1980, 102, 4456]. William G. Dauben* and Michael S. Kellogg, Department of Chemistry, University of California, Berkeley, California 94720.

On page 4459 , the last paragraph in the left column should read as follows: The minor primary product, anti,cis-tricyclo[5.4.0.0 ${ }^{8.11}$ ]undec-9-ene (27), the product predicted by orbital symmetry consideration (disrotatory), was furmed in $3 \%$ yield upon extended irradiation. The structure was determined by spectral analysis and by its stereospecific conversion to the cis diene 3 at $220^{\circ} \mathrm{C}$. Assignment of the anti stereochemistry was based on the very small NMR coupling of the bridgehead allylic protons.

Crystal and Molecular Structure of Cofacial Dicopper Hexyldi-porphyrin-7 [J. Am. Chem. Soc. 1980, 102, 7115]. Marcos H. Hatada, A. Tulinsky,* and C. K. Chang, Department of Chemistry, Michigan State University, East Lansing, Michigan 48824

Page 7116: the intra- and intermolecular slip angles are interchanged-intra should be $46.4^{\circ}$, inter should be $43.5^{\circ}$.

Pauling "3-Electron Bonds", "Increased-Valence", and 6-Electron 4-Center Bonding [J. Am. Chem. Soc. 1980, 102, 5195]. Richard D. Harcourt, Department of Physical Chemistry, University of Melbourne, Parkville, Victoria 3052, Australia.

Page 5196 above eq 3 and page 5197 two lines above references: replace "obtained" with "obtain".

Page 5197: add ", 12 " after "ref 7 " in the text.
Page 5198: (i) two lines below eq 16 , replace " 9 " with " 4 "; (ii) in ref 18 , replace " $2,1.5$ and 1 " with " $1,1.5$ and 2 "; (iii)
column 2, omit "of eq 10 " after "the CI wave function".
Page 5200: (i) in the caption for Figure 6, interchange $c$ and d; (ii) in ref 41, replace "P. Passmore" with "J. Passmore". Page 5201: in ref 52 , replace " $2 f$ " with " 2 g ".

Evidence for an Electron-Transfer Mechanism in the Reduction of Ketones by Main Group Metal Hydrides [J. Am. Chem. Soc. 1980, 102, 7779]. Eugene C. Ashby,* Anil B. Goel, and Robert N. DePriest, School of Chemistry, Georgia Institute of Technology, Atlanta, Georgia 30332

Page 7780; in ref $7 \mathrm{M}_{2} \mathrm{SO}_{4}$ should be $\mathrm{H}_{2} \mathrm{SO}_{4}$.
Page 7780: Scheme I should read as follows.
Scheme I


Accurate and Sensitive Determination, by a New Cobalt-59 Nuclear Magnetic Resonance Method, of Electron Acceptance and Hydrogen Bond Donation by Protic Solvents [J. Am. Chem. Soc. 1980, 102, 7818-7820]. Pierre Laszlo* and Armel Stockis, Institut de Chimie Organique et de Biochimie, Université de Liège, Sart-Tilman, B-4000 Liège, Belgium.

References 14 and 15 have been inadvertently interchanged. They should read: (14) Samo, M.; Yamatera, H.; Hatano, Y. Chem. Phys. Lett. 1979, 60, 257-260; and (15) Cotton, F. A.; Wilkinson, G. "Advanced Inorganic Chemistry", 3rd ed.; Wiley: New York, 1972.


[^0]:    (19) Wieland, T.; Grimm, D. Chem. Ber. 1965, 98, 1727.
    (20) McEvoy, F. J.; Allen, G. R., Jr. J. Org. Chem. 1973, 38, 3350-3352. Borane dimethyl sulfide is preferred for the reduction of 3,3-dimethyloxindole to 3,3-dimethylindoline (Hester, J. B., unpublished results, The Upjohn Company).
    (21) For example: McOmie, J. F. W.; Watts, M. L.; West, D. E. Tetrahedron 1968, 24, 2289-2292. Vickery, E. H.; Pahler, L. F.; Eisenbraun, E. J. J. Org. Chem. 1979, 44, 4444-4446. Hanessian, S.; Guindon, Y. Tetrahedron Lett. 1980, 2305-2308. Williard, P. G.; Fryhle, C. B. Ibid. 1980, 3731-3734. This procedure afforded some of the desired 12 .
    (22) Kelly, T. R.; Dali, H. M.; Tsang, W.-G. Tetrahedron Lett. 1977, 3859-3860 and ref 2-4 described therein.
    (23) Prepared in $95 \%$ yield from 4-chloro-3-nitroanisole: $48 \% \mathrm{HBr} /$ AcOH, $120^{\circ} \mathrm{C}, 24 \mathrm{~h} ; \mathrm{PhCH}_{2} \mathrm{Br}, \mathrm{K}_{2} \mathrm{CO}_{3}$, acetone, DMF; mp 46.5-48.7 ${ }^{\circ} \mathrm{C}$.

