

*Joseph B. Lander*

Illinois  
Institute of  
Technology  
**N - M - R**  
Newsletter

**No. 103**  
APRIL, 1967

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Deadline Date : No. 104 - 15 May 1967

A monthly collection of informal private letters from laboratories of NMR. Information contained herein is solely for the use of the reader. Quotation is not permitted, except by direct arrangement with the author of the letter, and the material quoted must be referred to as a "Private Communication".

INSTITUT FÜR ORGANISCHE CHEMIE  
DER UNIVERSITÄT KÖLN

W. Bremser, Dr. H. Günther

5 KÖLN, 15. März 1967  
ZÜLPICHER STRASSE 47  
TELEFON: 2024 2239

Professor Bernard L. Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Chicago 16, Illinois 60616

Another Program!

Sehr geehrter Herr Professor Shapiro,

erfahrungsgemäß ergibt sich bei der Bestimmung der Linienfrequenzen mit Hilfe der Seitenbandenmethode nach dem Ausmessen der Linien eine Menge relativ eintöniger und zeitraubender Rechenoperationen. Um dieses Verfahren abzukürzen und gleichzeitig Rechenfehler auszuschließen, haben wir ein Fortran-Programm für eine IBM 360 geschrieben. Obwohl auf dem Gebiet der NMR-Spektroskopie die verschiedenartigsten Programme existieren, ist uns bis jetzt noch nichts über ein derartiges Hilfsmittel bei der Spektrenauswertung bekanntgeworden. Wir möchten deshalb an dieser Stelle kurz darauf hinweisen.

Auf Lochkarten werden folgende Meßwerte eingegeben:

1. die reziproke Frequenz der Seitenbanden [sec],
2. der Abstand der Seitenbanden und der Linien von einer beliebigen Nullmarke [cm],
3. die Anzahl der Spektren (max. 12),
4. die Anzahl der Linien (max. 45).

Neben den Input-Daten druckt die Maschine folgende Ergebnisse:

1. den SCALE-Faktor jedes Spektrums,
2. die Frequenzen der Einzellinien, bezogen auf Tetramethylsilan = + 600 Hz, und ihre Abweichung vom Mittelwert,
3. die Mittelwerte der unter 2. berechneten Linienfrequenzen einschließlich Streuung, Standardabweichung und Standardabweichung des Mittelwertes,
4. die mittlere Abweichung der Linien eines Spektrums,
5. die mittlere Standardabweichung aller Spektren.

Außerdem wird jeder Meßwert auf seine Zugehörigkeit zur Grundgesamtheit getestet, und alle Ausreißer werden gekennzeichnet. Sind Ausreißer vorhanden, so beginnt automatisch eine neue Rechnung, bei der alle Ausreißer unberücksichtigt bleiben.

Eine Liste des Programms steht Interessenten auf Anfrage zur Verfügung.

Mit freundlichen Grüßen

*W. Bremser*  
(W. Bremser)

*H. Günther*  
(Dr. H. Günther)

CHEMISCHES LABORATORIUM  
DER UNIVERSITÄT MÜNCHEN  
INSTITUT FÜR ORGANISCHE CHEMIE  
Prof. Dr. Herbert Zimmermann

8000 MÜNCHEN 2, 17. März 1967  
Karlstr. 23 - Tel. 59021

Herrn Prof. Dr. Bernard L. Shapiro  
Illinois Institute of Technology  
Department of Chemistry  
Chicago, Ill. 60616  
USA

**Titel: "Die Dimerisierung von 2-t-Butylphenol, Berechnung  
von Assoziationskonstanten"**

Sehr geehrter Herr Professor Shapiro!

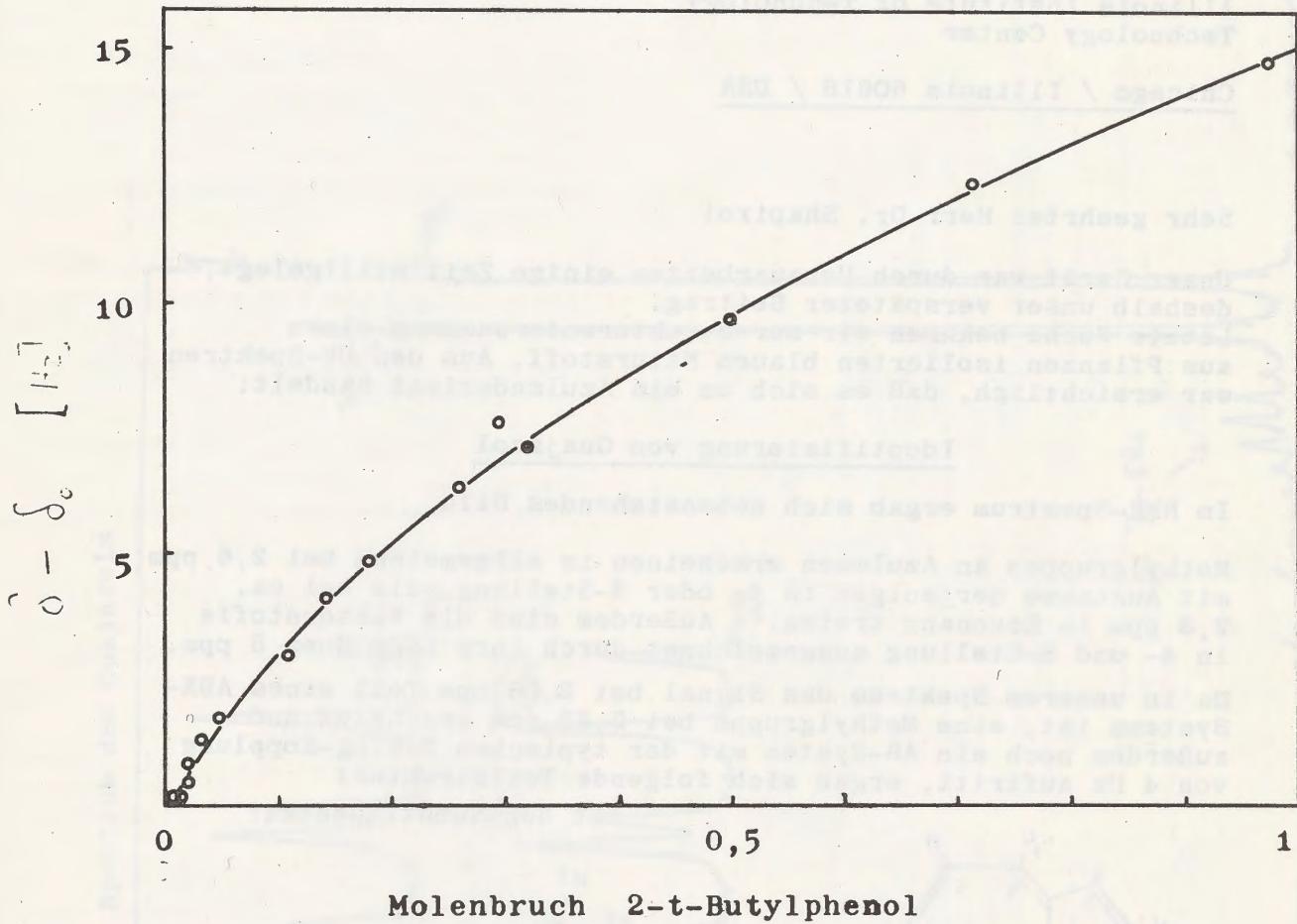
Bei NMR-Untersuchungen von Assoziationsvorgängen stießen wir auf die Frage, wie am besten die Assoziationskonstanten von Wasserstoffbrückenkomplexen zu bestimmen sind.

Eine Anzahl von Berechnungsmethoden sind veröffentlicht worden, die von der Steigung der Chemical Shift/Molenbruch-Kurve im Grenzwert unendlicher Verdünnung ausgehen. Die so berechneten Assoziationskonstanten und Assoziationsshifts werden meist durch Iteration verbessert, weil der benötigte Grenzwert experimentell schlecht zugänglich ist. In Systemen mit schwachen Wasserstoffbrückenbindungen gelingt jedoch eine vollständige Beschreibung der Konzentrationsabhängigkeit des Chemical Shift mit Hilfe des Massenwirkungsgesetzes<sup>1)</sup>.

Wir haben das bereits von Somers<sup>2)</sup> untersuchte Monomeren-Dimeren-Gleichgewicht von 2-t-Butylphenol in  $\text{CCl}_4$  als Lösungsmittel neu vermessen und erhielten aus experimentellen Werten, die mit den seinen übereinstimmen, einen Wert der Gleichgewichtskonstanten  $K = 0,53 \pm 0,1$ . Mit der Annahme, daß die Dimeren offene Struktur haben, beträgt der Assoziationsshift  $\Delta \nu = 69$  Hz. In der Abbildung ist die gute Übereinstimmung

- 2 -

der experimentellen Daten mit der theoretisch berechneten Kurve zu sehen.



Somers berechnete  $K = 1$  und  $\Delta \nu = 24$  Hz. Wie man sieht, hängen also Assoziationskonstanten zur Zeit noch ebenso sehr von der angewendeten Berechnungsweise ab wie vom Experiment.

Mit freundlichen Grüßen

F. Strohbusch  
(F. Strohbusch)

H. Zimmermann  
(H. Zimmermann)

- 1) Howard, Jumper, Emerson, J. chem. Phys. 35, 1911 (1961)
- 2) Somers, Gutowsky, J. amer. chem. Soc. 85, 3065 (1963)

Max-Planck-Institut für Biochemie  
Dr. J. Sonnenbichler

München 15, den 17.3.1967  
Goethestraße 31  
Fernruf 594261/63  
Postfach 64

Assoc. Prof. B. L. Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Technology Center

Chicago / Illinois 60616 / USA

Sehr geehrter Herr Dr. Shapiro!

Unser Gerät war durch Umbauarbeiten einige Zeit stillgelegt, deshalb unser verspäteter Beitrag.  
Letzte Woche bekamen wir zur Strukturuntersuchung einen aus Pflanzen isolierten blauen Naturstoff. Aus den UV-Spektren war ersichtlich, daß es sich um ein Azulenderivat handelt:

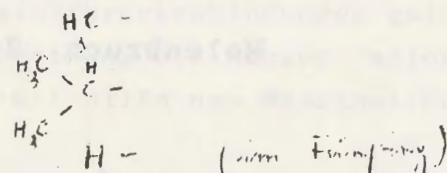
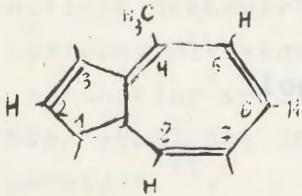
#### Identifizierung von Guajazol

Im NMR-Spektrum ergab sich nebenstehendes Bild.

Methylgruppen an Azulenen erscheinen im allgemeinen bei 2,6 ppm mit Ausnahme derjenigen in 4- oder 8-Stellung, die bei ca. 2,8 ppm in Resonanz treten.<sup>1)</sup> Außerdem sind die Wasserstoffe in 4- und 8-Stellung ausgezeichnet durch ihre Lage über 8 ppm.

Da in unserem Spektrum das Signal bei 8,06 ppm Teil eines ABX-Systems ist, eine Methylgruppe bei 2,78 ppm erscheint und außerdem noch ein AB-System mit der typischen 5-Ring-Kopplung von 4 Hz auftritt, ergab sich folgende Teilstruktur:

mit den Substituenten:



Beim Einstrahlen auf die Methylgruppe bei 2,60 ppm erhält man eine deutliche Verschärfung des Doublets bei 7,46 ppm; beim Einstrahlen auf das Signal bei 3,02 ppm erhält man ebenso eine Verschärfung des Signals bei 8,06 ppm.

Durch diese long range Entkopplungen (beides Allyl-Kopplungen) war klar, daß die Isopropylgruppe im 7-Ring steht, die zweite Methylgruppe im 5-Ring. Die Stellung (1- oder 3-) dieser letzten Methylgruppe konnte allerdings erst durch Vergleichsspektren mit Guajazol (1,4-Dimethyl-7-isopropyl-azulen) geklärt werden, das identische physikalische Daten hat.

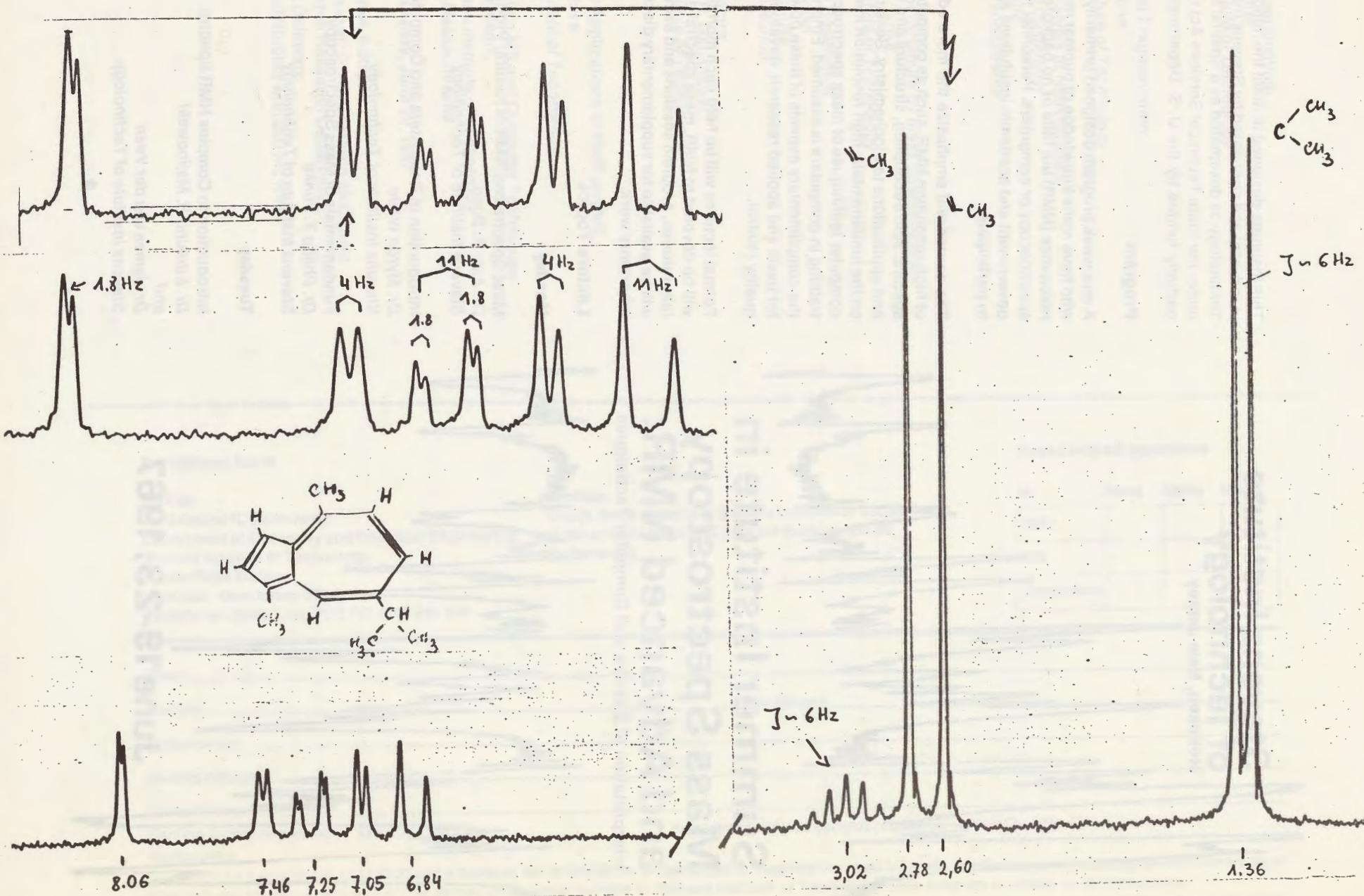
Mit freundlichem Gruß

Ihr

1) D. Meuche et al.

Helv. 46, 2483 (1963)

Spektrum des Guajazols



# Stevens Institute of Technology

Hoboken, New Jersey

This Institute, designed to meet the needs of scientists in industry and sponsored by Stevens Institute of Technology, is designated as a Special Merit Program under the State Technical Services Act of 1966 and is partially funded by the U. S. Department of Commerce.

## Program

A one-week program designed primarily for chemists who have some knowledge of nuclear magnetic resonance (NMR) but little or no background in mass spectroscopy or computers. Personnel from industrial, government and academic institutions are invited to participate.

The course will emphasize the more advanced aspects of high resolution NMR, such as computer analysis of spectra, spin decoupling, structure and stereochemistry, and applications to biochemistry. Sessions will be held on the fundamentals, high resolution methods and computer techniques of mass spectroscopy. No previous training in computers is assumed. Emphasis will be on the complimentary aspects of these powerful techniques for basic and applied research, development and quality control.

Formal lectures will be held each morning. Afternoons will be devoted to NMR, mass spectral and computer laboratories, problem sessions and seminars. Evenings will be available for supplementary discussions and laboratory work.

## Lecture Topics

### Monday

#### Mass Spectra and NMR of Natural Products

*Dr. Ajay K. Bose*

*Stevens Institute of Technology*

#### Introduction to Computers and Computer Language

*Dr. Myron White*

*Stevens Institute of Technology*

#### Fundamentals of Mass Spectroscopy

*Dr. Phillip T. Funke*

*Stevens Institute of Technology*

### Tuesday

#### Introduction to Complex NMR Spectra

*Dr. Edmund R. Malinowski*

*and*

*Dr. James van der Veen*

*Stevens Institute of Technology*

**June 19-23, 1967**

## Computer Programming

*Dr. Myron White**Stevens Institute of Technology***Wednesday**

## Mass Spectral Fragmentation

*Dr. Ajay K. Bose**Stevens Institute of Technology*

## Computer Analysis of NMR Spectra

*Dr. Salvatore Castellano**Mellon Institute**Pittsburgh, Pennsylvania***Thursday**

## Elucidation of Structure by Mass Spectroscopy

*Dr. Phillip T. Funke**Stevens Institute of Technology*

## NMR Double Resonance

*Dr. Ray Freeman**Varian Associates**Palo Alto, California*C<sup>13</sup> NMR Spectra*Dr. Edmund R. Malinowski**Stevens Institute of Technology***Friday**

## Biochemical Applications of NMR and MS

*Dr. Ajay K. Bose**Stevens Institute of Technology*

## High Resolution MS and Computer Techniques

*Dr. Klaus Biemann**Massachusetts Institute of Technology**Cambridge, Massachusetts***Banquet, Thursday, June 22, 1967**

Stevens Center, 6:30 p.m.

Banquet Speaker: Dr. C. Cameron McDonald

Du Pont Central Research Department

Wilmington, Delaware

"Biochemical Studies with 220 Mc NMR"

## Please indicate experience

in	None	Some	Much
NMR			
MS			
Computers			

**Enclose:**  
Check made payable to Stevens Institute of Technology  
in the amount of \$200.00 (this fee includes \$10.00  
for banquet).

## Enrollment Form

## Mail to:

Dr. Edmund R. Malinowski  
Department of Chemistry and Chemical Engineering  
Stevens Institute of Technology  
Castle Point Station  
Hoboken, New Jersey 07030

Telephone: (Area Code 201) 792-2700 Ext. 344

Name _____	Position _____	Telephone _____	Accommodation on campus requested
Organization _____	Mailing Address _____	Home Address _____	Yes <input type="checkbox"/> No <input type="checkbox"/>
Parking facility requested	Registration	There will be a course fee of \$190.00 and a banquet fee of \$10.00 for all participants. Registration must be made in advance by completing the enrollment form attached and mailing it with a check or money order made payable to Stevens Institute of Technology. This program is limited to 30 participants.	

STATE UNIVERSITY OF NEW YORK  
AT STONY BROOK

DEPARTMENT OF CHEMISTRY

STONY BROOK, N.Y. 11790

March 13, 1967

Dr. B. L. Shapiro  
IITNMR  
Department of Chemistry  
Illinois Institute of Technology  
Chicago, Illinois 60616

Dear Barry:

Short Title:  $F^{19}$  Shieldings in Ionic Crystals

Our experimental results on  $F^{19}$  shieldings in some ionic crystals are reported in the Table below.

	$\sigma^a$	ave. dev. <sup>b</sup>		$\sigma^a$	ave. dev.
LiF	-197	11	$BeF_2^d$	-130	9
NaF	-105	6	$MgF_2^d$	-135	3
KF	-191	5	$CaF_2$	-223	7
RbF	-229	4	$SrF_2$	-245	2
CsF	-311	7	$BaF_2$	-313	6
$ZnF_2^d$	-121	5	$KZnF_3^d$	-144	3
$CdF_2^d$	-132	4	$KMgF_3^d$	-125	7
$Ca_5F(PO_4)_3$	-210 <sup>c</sup>	10			

<sup>a</sup> In ppm relative to free (not aqueous)  $F^-$ , assuming that  $\sigma(F^-) - \sigma(CFCl_3) = 137.8$  ppm.

<sup>b</sup> In ppm. Line widths varied between about 150 and 500 ppm (at the resonance frequency of 94.077 MHz).

<sup>c</sup> Average value.  $\sigma_1 = -182$ ,  $\sigma_{II} = -266$

<sup>d</sup> Shielding tensor expected to be anisotropic. Only approximate average shielding measured.

The measurements were made on powders and single crystals in 5mm O.D. sample tubes on a Varian HR-100, with sweep rates of about 1 to 10 gauss/min. and audio modulation frequencies of 4 to 10 kHz.<sup>1</sup> The anisotropic shielding in  $Ca_5F(PO_4)_3$  (Durango fluorapatite) was measured by rotation of a single crystal about three mutually perpendicular axes.

Using the Kondo and Yamashita<sup>2</sup> "overlap" model, with integrals calculated from Hartree-Fock free-ion wave functions, we obtain the "average energy denominators" ( $\Delta E$ ) shown below (in eV)

LiF	17.3	B <sub>2</sub> F <sub>7</sub>	15.2
NaF	8.8	MgF <sub>2</sub>	12.8
KF	5.1	CaF <sub>2</sub>	8.1
RbF	4.9		
CsF	4.3		

For fluorapatite, the  $\Delta E$  obtained in this way from the average shielding is 7.8 eV. It gives a calculated value for the anisotropy of 87 ppm ( $\sigma_{\perp} - \sigma_{\parallel}$ ) quite close to the experimental value of 84 ppm.

Although plausible relationships can be constructed between the calculated average  $\Delta E$  values given by this perturbation theory and certain experimental excitation energies, no rigorous connection has been found, and the theory is useful primarily as an interpolative device. To improve its usefulness for such purposes, we have been trying some empirical schemes employing multiple energy denominators. Some of these will be reported upon at a later date.

<sup>1</sup> P. C. Lauterbur, 7th ENC, Pittsburgh, Pennsylvania (1966)

<sup>2</sup> J. Kondo and J. Yamashita, J. Phys. Chem. Solids 10, 245 (1959). See also D. W. Hafemeister and W. H. Flygare, J. Chem. Phys. 44, 3584 (1966) for similar recent work and additional reference.

Yours truly,

Sean Cawley\*  
Battelle Memorial Institute  
505 King Avenue  
Columbus, Ohio 43201

P. C. Lauterbur  
Associate Professor

pb

DEPARTMENT OF ORGANIC CHEMISTRY  
THE UNIVERSITY

Address: BLOEMSINGEL 10, GRONINGEN (HOLLAND)  
Tel.: 05900-34841

HEAD: PROF. DR. H. WYNBERG

Groningen, March 28, 1967.

Professor B.L. Shapiro,  
Department of Chemistry,  
Illinois Institute of Technology,  
Chicago, Illinois 60616  
U.S.A.

Dear Dr. Shapiro:

We hope you will accept this contribution for the IIT NMR Newsletters and that it keeps us on your mailing list.

a. Protonated furans.

In the accompanying table we have listed the NMR-data of some furans dissolved in concentrated sulfuric acid. These data appear consistent with the protonated structures shown. You will notice that the values for the chemical shifts of the  $\alpha$ -protons range from  $\delta$  6.48 to  $\delta$  6.73 except for the  $\alpha$ -proton in compound XIII ( $\delta$  7.69). Another anomaly is observed for one of the  $\beta$ -protons in compound IV ( $\delta$  9.62), the  $\beta$ -protons in the other compounds having an absorption range from  $\delta$  7.63 to  $\delta$  8.08.

Although solvation effects in these sterically hindered molecules might offer an explanation for these remarkable shifts, suggestions of readers will be appreciated.

Drs.U.E.Wiersum

Prof.Dr.H.Wynberg

b. Exchange in exchange formula.

Workers in the field of chemical exchange and hindered internal rotation should be aware of an annoying misprint in a formula first obtained by Gutowsky, McCall and Slichter. This misprint -  $p_A$  has been exchanged with  $p_B$  - is found in at least 3<sup>A</sup> books or chapters on this subject:

PHYSIKALISCHES INSTITUT  
DER UNIVERSITÄT BASEL  
PHYSIKALISCHE KUNGSLEHRSTUHL  
PROFESSOR Professor B.L. Shapiro

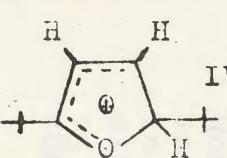
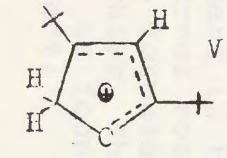
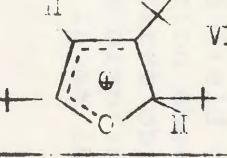
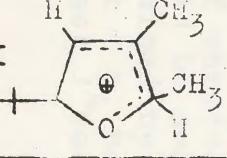
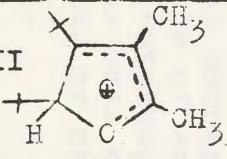
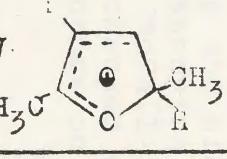
March 28, 1967

1. J.A. Pople, W.G. Schneider and H.J. Bernstein, High Resolution Nuclear Magnetic Resonance, p. 221, McGraw-Hill Book Company, New York, 1959.
2. L.H. Piette, NMR and EPR Spectroscopy, chapter 9, p. 143, The NMR-EPR staff of Varian Associates (ed.), Pergamon Press, Oxford 1960.
3. H. Strehlow, Magnetische Kernresonanz und chemische Struktur, p. 107, Dr. Dietrich Steinkopf Verlag, Darmstadt, 1962.

*Sir*  
Drs. S. van der Werf

TABLE

Chemical shifts\* (in  $\delta$ ) and coupling constants of protonated furans

	H (2)	H (3)	H (4)	H (5)	$\text{CH}_3$ (2)	$\text{CH}_3$ (3)	$\text{CH}_3$ (5)	$t\text{-Bu}^{**}$
	IV 6.73 <sup>a</sup>	8.08 <sup>b</sup>	9.62 <sup>c</sup>					1.74; 2.13
		7.79		6.62 <sup>d</sup>				1.96; 2.07
	VI 6.48	7.77	7.77					1.72; 1.96; 2.00
	XII 6.59 <sup>e</sup>		7.63		2.25 <sup>f</sup>	3.07		1.96
	XIII 6.69 <sup>g</sup>			3.18 <sup>g</sup>	2.33			1.67; 2.06
	XIV 6.78 <sup>h</sup>		7.66		2.45 <sup>i</sup>		3.49 <sup>j</sup>	1.95

\* The NMR spectra were taken on a Varian A-60 using tetramethylsilane in trifluoroacetic acid as an external standard ( $\delta_{\text{TMS}} = 0$ ).

\*\* The  $t$ -butyl groups cannot be assigned unambiguously.

- 103-12
- a) doublet,  $J_{2,3} = 1.2$  cps
  - b) two doublets,  
 $J_{3,4} = 6.0$  cps and  
 $J_{2,3} = 1.2$  cps
  - c) doublet,  $J_{3,4} = 6.0$  cps
  - d) two protons
  - e) quadruplet,  
 $J_{\text{H}(2)-\text{CH}_3(2)} = 7.5$  cps
  - f) doublet,  
 $J_{\text{H}(2)-\text{CH}_3(2)} = 7.5$  cps
  - g) broadened peaks,  
 $J_{\text{H}(5)-\text{CH}_3(2)} = 0.9$  cps
  - h) multiplet
  - i) doublet,  
 $J_{\text{H}(2)-\text{CH}_3(2)} = 7.4$  cps
  - j) doublet,  
 $J_{\text{H}(2)-\text{CH}_3(5)} = 2.9$  cps

PHYSIKALISCHES INSTITUT  
DER UNIVERSITÄT BASEL  
4056 BASEL, SCHWEIZ - KLINGELBERGSTR. 82  
VORSTEHER: PROF. DR. P. HUBER

Basel, March 17, 1967

Prof. B.L. Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Chicago Ill. 60616

U.S.A.

Postdoctoral Position Available

Dear Barry,

I will have funds available for a postdoctoral position for one year, beginning November 1st, 1967. The work will involve NMR exclusively ( $^{17}\text{O}$ , D or H-resonance, analysis of complex spectra). Any person interested should write to me as soon as possible.

Sincerely yours,

Pete-

Prof. Dr. P. Diehl

# The Goodyear Tire & Rubber Company

Akron, Ohio 44316

RESEARCH DIVISION  
142 GOODYEAR BLVD.

March 30, 1967

Dr Bernard L Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Chicago, Illinois 60616

RE: Configuration of Isoprene Structural Unit in the Butyl Rubber

Dear Dr Shapiro:

In continuing our work with the time averaging device reported in our last letter (IITNMRN 92 51 1966) we are using this technique for determining the configuration of isoprene unit in the butyl rubber.

In making butyl rubber, a small amount of isoprene is usually copolymerized with the isobutylene to facilitate vulcanization. The isoprene component thus incorporated in the butyl rubber can be present in three possible configurations; i.e. 1,4-, 1,2-, and 3,4-. The question concerning which of these configurations was the prevalent one in butyl rubber was first investigated by Rehner<sup>(1)</sup>. The evidence from his chemical method enabled him to conclude indirectly that the isoprene segment in the butyl rubber was essentially in the 1,4-configuration.

By means of the time averaging technique, we are able to observe the absorption peak due to the 1,4-isoprene unit in a typical commercial butyl rubber. Since the IR has failed to detect such low concentration of isoprene in the butyl rubber<sup>(2)</sup>, the present NMR result seems to be the only direct observation of this structural component. We would also like to point out that such techniques may be useful in determining quantitatively the isoprene unit in butyl rubbers.

Our apologies for being tardy; we look forward to the continued receipt of your most valuable Newsletter.

Sincerely yours,

Hung Yu Chen  
Spectroscopy Section  
RESEARCH DIVISION

Hung Yu Chen  
bj 3/30/67

(1) J Rehner, Jr, Ind Eng Chem 36, 46 (1944).

(2) L R McNall & L T Eby, Anal Chem 29 951 (1957).

GEFFER GRADUATE SCHOOL OF SCIENCE  
UNIVERSITY OF TORONTO  
1967

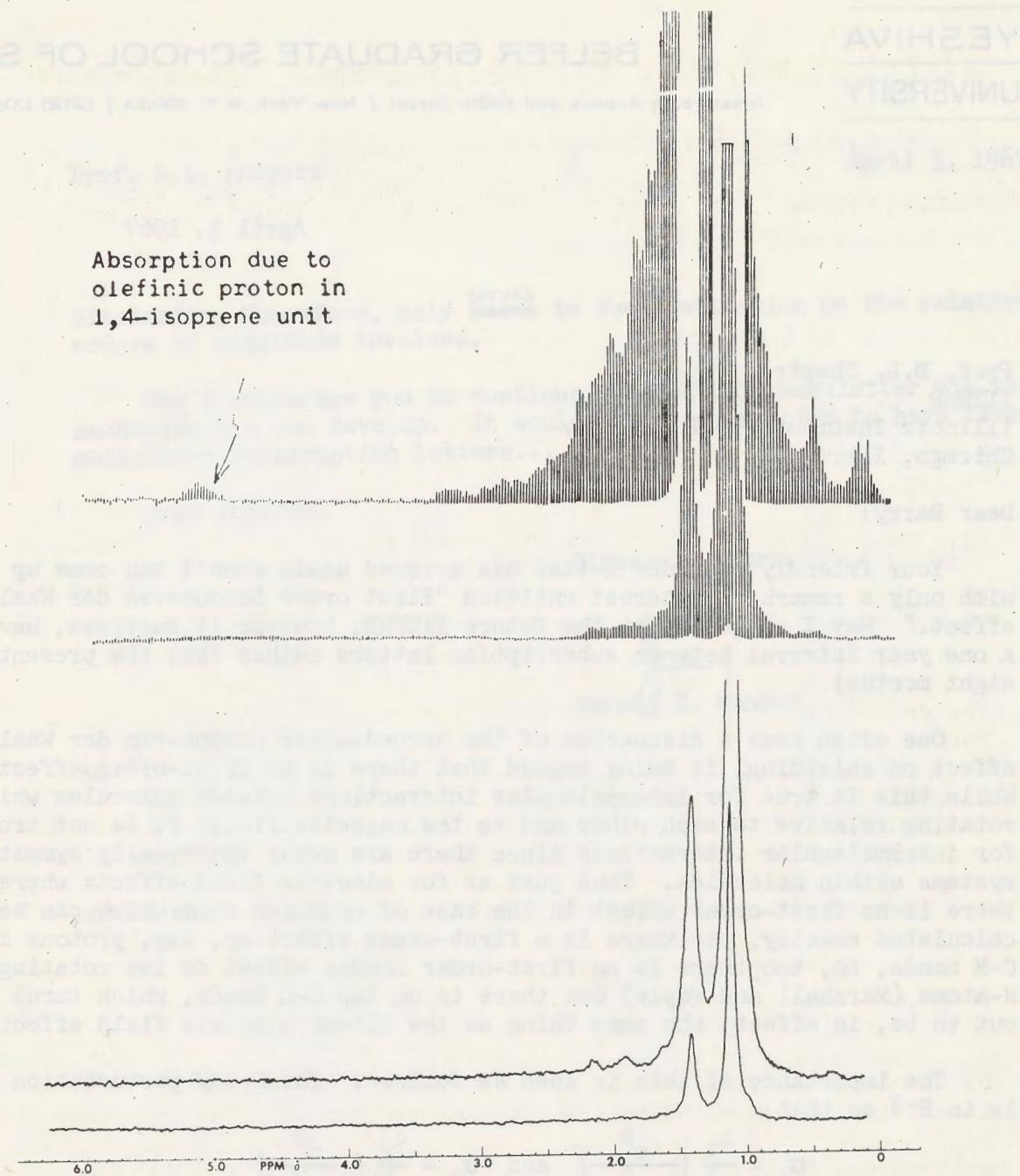


Fig. Time Averaged NMR Spectra Of The Butyl Rubber in  $\text{CCl}_4$  Solution  
(Enjay Butyl Rubber #325, With Nominal Isoprene Content 2.2%  
By Mol.)



YESHIVA  
UNIVERSITY

## BELFER GRADUATE SCHOOL OF SCIENCE

Amsterdam Avenue and 186th Street / New York, N.Y. 10033 / (212) Lorraine 8-8400

RESEARCH DIVISION  
142 GOODYEAR BLDG.

April 3, 1967

Prof. B.L. Shapiro  
IITNMR  
Illinois Institute of Technology  
Chicago, Ill.

Dear Barry:

Your friendly reminder letter has arrived again when I can come up with only a remark of interest entitled "First order London-van der Waals effect." May I suggest that the future IITNMR, however it survives, have a one year interval between subscription letters rather than the present eight months!

One often sees a discussion of the second-order London-van der Waals effect on shielding, it being argued that there is no first-order effect. While this is true for intermolecular interactions between molecules which rotate relative to each other and to the magnetic field, it is not true for intramolecular interactions since there are never spherically symmetric systems within molecules. Thus just as for electric field effects where there is no first-order effect in the case of hydrogen atoms which can be calculated exactly, yet there is a first-order effect on, say, protons in C-H bonds, so, too, there is no first-order London effect on two rotating H-atoms (Marshall and Pople) but there is on two C-H bonds, which turns out to be, in effect, the same thing as the linear electric field effect.

The importance of this is seen as follows. The L-vdW perturbation is in  $R^{-3}$  so that

$$\sigma_1 = \frac{c_1}{R^3} \left( \frac{e^2}{3mc^2 a_0} \right) \quad \text{and} \quad \sigma_2 = \frac{c_2}{R^6} \left( \frac{e^2}{3mc^2 a_0} \right)$$

with  $c_1$  containing dipolar angular dependence so that an angular average vanishes and  $c_2$  containing the square of such a dependence, whose average is non-vanishing. Taking the value of  $|c_2| = 24$  from two H-atoms, and estimating  $|c_1|$  to be  $2/3$  for parallel C-H bonds which are perpendicular to the line joining them, one sees that  $\sigma_1$  dominates over  $\sigma_2$  at all  $R > 1.6 \text{ \AA}$ , i.e.  $R^3 (\text{a.u.}) > 36$ . The value of  $c_1$  can be crudely calculated following my J. Chem. Phys. 37, 34 (1962) article which should give the same result as via the linear electric field argument. The present

Prof. B.L. Shapiro

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April 3, 1967

discussion, therefore, only ~~serves~~ to focus attention on the relative orders of magnitude involved.

May I encourage you to continue running this newsletter via whatever mechanism you can develop. It would, however, be nice to have fewer obligatory subscription letters....

Best regards,

Sincerely yours,

*Jerry*  
Jeremy I. Musher

# KARL-MARX-UNIVERSITÄT

PHYSIKALISCHES INSTITUT

KMU, Physikalisches Institut, 701 Leipzig, Linnéstraße 5

Herrn  
Prof. Dr. B. L. Shapiro

Department of Chemistry  
Illinois Institute of Technology  
Chicago, Illinois 60616

U S A

701 LEIPZIG

Ihre Zeichen

Ihre Nachricht vom

Unsere Nachricht vom

Unsere Zeichen

Linnéstraße 5

24.2.1967

Betrifft Isotopieeffekt der chemischen Verschiebung in deuteriertem Methanol

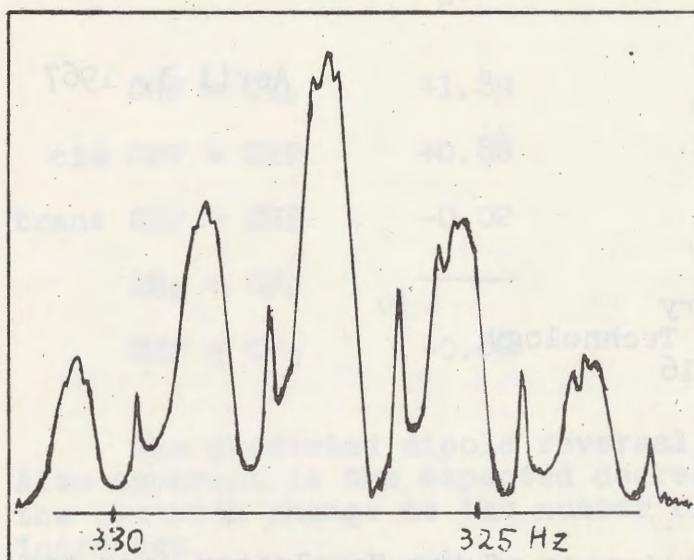
Sehr geehrter Herr Professor!

Ein zu ca. 99% deuteriertes, trockenes Methanol steht zur Verfügung.

Es kann aus den Komponenten  $\text{CH}_3\text{OH}$ ,  $\text{CH}_3\text{OD}$ ,  $\text{CH}_2\text{DOH}$ ,  $\text{CH}_2\text{DOD}$ ,  $\text{CHD}_2\text{OH}$ ,  $\text{CHD}_2\text{OD}$ ,  $\text{CD}_3\text{OH}$  und  $\text{CD}_3\text{OD}$  bestehen. Das  $^1\text{-NMR}$ -Spektrum bei 100 MHz zeigt ein einzelnes Signal (OH-Proton) bei  $\delta = 4.72$  ppm und zwei überlagerte Quintetts bei  $\delta = 3.27$  ppm ( $J_{\text{HD}} = 1.66$  Hz) und  $\delta = 3.26$  ppm ( $J'_{\text{HD}} = 1.69$  Hz). Die Kopplungskonstanten  $J_{\text{HD}}$  und  $J'_{\text{HD}}$  entsprechen in guter Näherung der nach  $J_{\text{HH}}/J_{\text{HD}} = \frac{1}{10.4}$  ( $J_{\text{HH}}$ -Methanol = 10.4 Hz) zu erwartenden Größe. Die Signale der Quintetts besitzen auch nahezu die theoretischen Intensitätsverhältnisse 1:2:3:2:1. Die Komponenten  $\text{CHD}_2\text{OH}$  und  $\text{CHD}_2\text{OD}$  sind im  $^1\text{-NMR}$ -Spektrum bei 100 MHz auf Grund der unterschiedlichen chemischen Verschiebungen ( $\Delta\tau = 1$  Hz) der  $\text{CHD}_2$ -Gruppen gerade noch zu unterscheiden.

Das Substanzgemisch kann entsprechend diesem Spektrum nur aus  $\text{CHD}_2\text{OH}$ ,  $\text{CHD}_2\text{OD}$ ,  $\text{CD}_3\text{OH}$  und  $\text{CD}_3\text{OD}$  bestehen. Das der  $\text{CHD}_2$ -Gruppe in der Komponente  $\text{CHD}_2\text{OH}$  zugeordnete Quintett besteht aus schmalen Linien (Breite 0.3 Hz). Die fünf Signale der  $\text{CHD}_2$ -Gruppe in der Komponente  $\text{CHD}_2\text{OD}$  sind infolge einer Kopplung mit dem Deuteron der OD-Gruppe je-

weils in Triplets ( $J'' = 0.25$  Hz) aufgespalten. Die Aufenthaltsdauer des Deuterons in der OD-Stellung ist offenbar bedeutend größer als die des Protons in der OH-Stellung.



CD<sub>2</sub>H-Gruppen im  
H<sup>1</sup>-NMR-Spektrum

Durch die Integration der Signale nach Zugabe einer definierten Menge an Vergleichssubstanz (Benzol) kann das Verhältnis der Komponenten im Gemisch ermittelt werden.

Gefundene Zusammensetzung:

CHD <sub>2</sub> OH	( 0.32 ± 0.1 ) %
CHD <sub>2</sub> OD	( 3.25 ± 0.1 ) %
CD <sub>3</sub> OH	( 0.95 ± 0.1 ) %
CD <sub>3</sub> OD	( 95.49 ± 0.1 ) %

Mit freundlichen Grüßen!

Hans Erckmann

## UNIVERSITY OF KENTUCKY

LEXINGTON, KENTUCKY 40506

COLLEGE OF ARTS AND SCIENCES  
DEPARTMENT OF CHEMISTRY

April 3, 1967

Dr. B. L. Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Chicago, Illinois 60616

Dear Barry,

TEARS

A look at recent issues of the Newsletter (not to mention your personal notes) indicates that most letters begin with an apology for the delay in submission. Why not send each subscriber a blank page with a pre-printed salutation and initial apologetic paragraph? The savings in time for the "author" might expedite submission. Better yet, lets devise an appropriate abbreviation to save both time and space! We suggest TEARS (The Expressive Apologies Required are Submitted).

MORE SOLVENT DEPENDENT HF COUPLINGS

Recently, we reported the solvent dependence of HF couplings in vinyl fluoride and tri-fluoroethylene. (JCP 47, 1181 (1967)) The salient feature of that work was the observation that the direction in which  $^2J_{HF}$  changed for a given series of solvents depended on the orientation of the solute dipole. The Vicinal HF couplings also showed appreciable changes. We have now extended this study to the three isomeric di-fluoroethylenes. The changes in the HF couplings for the five fluoroethylenes studied to date are summarized below. The numerical values are equal to  $J_{DMSO} - J_{CCl_4}$  where J's are given the correct relative (probably absolute) signs. Maximum probable errors are  $\pm 0.1$  Hz or less.

Dr. B. L. Shapiro

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April 3, 1967

	$J_{\text{gem}}$	$J_{\text{cis}}$	$J_{\text{trans}}$
$\text{CHF} = \text{CH}_2$	+1.89	+2.14	+4.57
cis $\text{CHF} = \text{CHF}$	+0.88	—	+1.95
trans $\text{CHF} = \text{CHF}$	-0.02	+0.74	—
$\text{CH}_2 = \text{CF}_2$	—	+0.60	+2.50
$\text{CHF} = \text{CF}_2$	-0.66	-0.12	+1.75

The predicted dipole reversal effect is evident for  $^2J_{\text{HF}}$ . Also apparent is the expected decrease in the magnitude of the observed change as the number of electronegative substituents increases.

The most striking observations are the results for trans  $\text{CHF} = \text{CHF}$ . Since this molecule has no net dipole, we would predict no solute electric field effect and, thus, no solvent dependence of  $^2J_{\text{HF}}$ . The observations support this conclusion. Surprisingly, however, cis  $^3J_{\text{HF}}$  shows a "large" change! Obviously, this suggests the existence of phenomena which do not affect two-bond couplings but which do affect three-bond couplings. At the present time we attribute this to quadrupole effects. A full paper will be forthcoming shortly.

Yours truly,

Stanford L. Smith  
Asst. Professor of Chemistry

Arthur M. Ihrig

THE UNIVERSITY OF CONNECTICUT  
 THE COLLEGE OF LIBERAL ARTS AND SCIENCES

March 25, 1967

Dr. Barry Shapiro  
 Department of Chemistry  
 Illinois Institute of Technology  
 Chicago, Illinois 60616

Dear Dr. Shapiro:

We have been continuing our work in conformational analysis of acyclics and have been concentrating on the  $\beta$ -phenylethyl system,  $C_6H_5CH_2CH_2X$ . Among the derivatives whose n.m.r. spectrum we have analyzed and for which we have prepared the threo- $C_6H_5CH_2CHDX$  analogs are the alcohol, acetate, two ethers and a sulfonate ester. Our results - which are qualitatively correct at this stage but do not represent "final" values - are given below, where  $J$ ,  $J'$  are the two vicinal coupling constants and  $\Delta E = E_{\text{gauche}} - E_{\text{trans}}$ , i.e., the difference in energy between the gauche and trans conformers

X	$J, J'$	$J(\text{threo})$	$\Delta E(\text{kcal./mole})$
OH	7.0, 7.0	7.0	$\lesssim 0.15$
$OCOCH_3$	6.8, 7.8	6.8	$\approx 0.30$
$OCH_3$	6.9, 7.1	6.9	
$OC(C_6H_5)_3$	6.8, 6.9	6.8	
$OSO_2Br$	6.8, 6.9	6.8	$\} \lesssim 0.15$

It is easy to rationalize the small conformational energy difference of  $\beta$ -phenylethanol ( $X=OH$ ) since it was postulated several years ago, on the basis of infrared work, that there exists intramolecular hydrogen bonding with the aromatic ring and such hydrogen bonding could occur only in the gauche conformer. In fact, we looked at this compound to confirm such conclusions. However, the observation that the ethers and the sulfonate ester have about the same conformational energy difference as does the alcohol seems to negate the importance of intramolecular hydrogen bonding - at least as a factor in determining conformer distribution. We are currently measuring  $\Delta E$  as a function of concentration of  $\beta$ -phenylethanol, for if intramolecular hydrogen bonding is, in part, responsible for the conformer distribution then one should see important changes upon dilution. At present we suspect that our observations merely reflect the effectively small size of oxygen. For example, we have ascertained that  $\Delta E \approx 0.1$  kcal./mole in the acetates  $RCH_2CH_2OAc$ ,  $R=CH_3$ ,  $C_6H_5CH_2$ .

Sincerely,

Eugene I. Snyder



## FACULTEIT DER WISKUNDE EN NATUURWETENSCHAPPEN

KATHOLIEKE UNIVERSITEIT  
NIJMEGEN

Driehuizerweg 200, Nijmegen  
Telefoon (08800) 5 83 33  
Afdeling

Prof. B.L.Shapiro,  
Illinois Institute of Technology,  
Department of Chemistry,  
CHICAGO 16  
U.S.A.

Uw kenmerk

Uw brief van

Ons kenmerk:

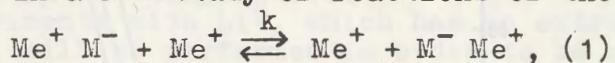
1044/dB/tb

Datum 3-4-1967.

Onderwerp: NMR study of a Li exchange reaction.

Dear Professor Shapiro,

We are engaged in a NMR study of reactions of the following type:



where  $\text{Me}^+$  designates an alkali metal ion and  $\text{M}^-$  a paramagnetic aromatic anion. We expected to see two effects in the NMR spectra of the metal ion nuclei:

1. a broadening of the NMR peak, due to the fact that the metal nucleus experiences a magnetic pulse upon association with a paramagnetic anion.
2. a shift of the resonance peak if the reaction rate ( $k$ ) is fast.

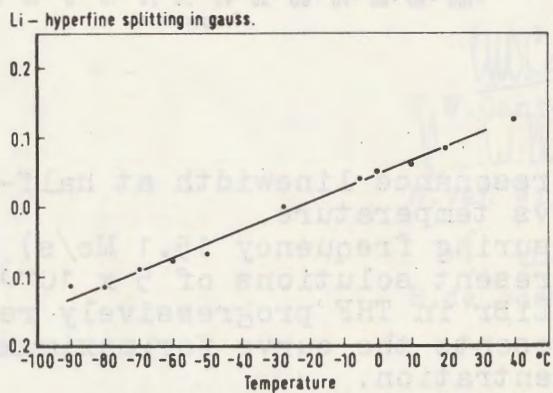
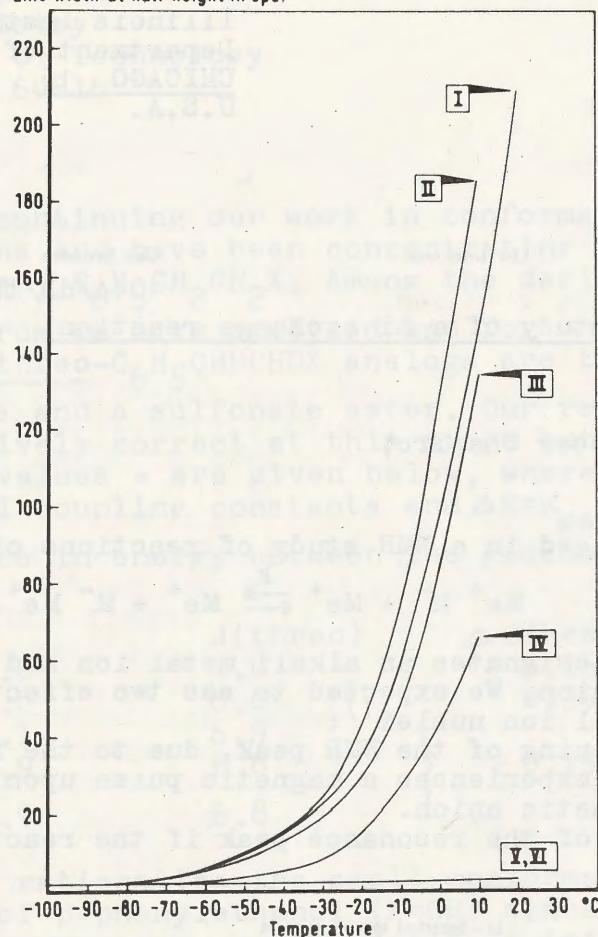


Fig.1. Li-hyperfine splitting in gauss vs temperature.  
The sign has not been incorporated on the Y-axis scale.

March 25, 1967

Line width at half height in cps.



**Fig. 2.**  $\text{Li}^7$  resonance linewidth at half-peak height in cps vs temperature.

(Measuring frequency 15.1 Mc/s)

I to IV represent solutions of  $5 \times 10^{-3}$  M fluorenone and 1 M LiBr in THF progressively reduced with Li. II represents the curve for maximum fluorenone-concentration.

V: Solution of 1 M LiBr in THF.

VI: Solution of 1 M LiBr and  $7.5 \times 10^{-3}$  M DPPH in THF.

We wish to report here the results of measurements on the system  $\text{Li}^+$ /fluorenone<sup>-</sup>-LiBr in tetrahydrofuran (THF). This system is of particular interest since ESR experiments by Hirota<sup>2)</sup> have demonstrated that the Li hyperfine splitting of  $\text{Li}^+$ /fluorenone<sup>-</sup> in THF varies with temperature and changes sign at  $-30^\circ\text{C}$  (figure 1). The results of the NMR measurements of the  $\text{Li}^7$  linewidth as function of temperature and fluorenone<sup>-</sup> concentration are summarised in figure 2. The linewidth increases with increasing temperature and increasing concentration of fluorenone<sup>-</sup>. That this broadening can be attributed unambiguously to the effect of reaction (1) is demonstrated by the  $\text{Li}^7$  linewidth variation in the presence of DPPH (fig. 2. curve VI) and the decrease in linewidth when fluorenone<sup>-</sup> is further reduced to the dinegative ion (fig. 2. curves III and IV). We did not observe a shift of the resonance line of  $\text{Li}^7$  in solutions of 1 M LiBr in THF with fluorenone<sup>-</sup> in concentrations up to 0.1 M over the temperature region of  $-100^\circ\text{C}$  to roomtemperature.

Figure 2 shows that there is no direct correlation with the data of the ESR experiments; the linebroadening is not governed by the magnitude of the metal ion hyperfine splitting. We attribute the observed linebroadening to complete dephasing of the  $\text{Li}^7$  nuclear spins by the quadrupole interaction upon association (strong pulse limit). The linebroadening is then determined only by the lifetime of the free  $\text{Li}^+$  ions, thus by the concentration of the fluorenone<sup>-</sup> and the magnitude of the rate constant ( $k$ ) of the exchange reaction. In agreement with this explanation is the observed dependence of the linebroadening on the concentration of fluorenone<sup>-</sup> and on the temperature.

Experiments with  $\text{Li}^6$ , which has an extremely small quadrupole moment, will be performed in order to be able to verify the validity of this explanation.

The absence of a shift of the  $\text{Li}^7$  resonance line indicates that the  $\text{Li}^+$  exchange rate is slow compared with the hyperfine splitting in cps. An approximate upper limit for the exchange rate at  $-80^\circ\text{C}$ , calculated for a maximal fluorenone<sup>-</sup> concentration of 0.1 M, is  $10^7 \text{ Mole}^{-1} \text{ sec}^{-1}$ .

1. E.de Boer and C.MacLean, J. Chem.Phys. 44, 1334 (1966)
2. N.Hirota, J. Phys.Chem. 71, 127 (1967)

G.W.Canters

G.W.Canters.

J.W.Wills

H.van Willigen.

E.de Boer

E.de Boer.

DIVISION OF PHYSICAL CHEMISTRY  
THE ROYAL INSTITUTE OF TECHNOLOGYSTOCKHOLM 70  
SWEDEN

April 5, 1967

Cable address: Technology

EF/MH

Dr. Bernard L. Shapiro  
Department of Chemistry  
Illinois Institute of TechnologyCHICAGO 16, Illinois  
USAFreezing of water in clays

Dear Dr. Shapiro,

One of us (D.M.A.) has earlier observed by X-ray techniques (Soil Sci. Soc. Amer. Proc. 29, 498, 1965) that the inter-crystalline distances of water-containing montmorillonite suddenly decrease on freezing at 0°C. The magnitude of the decrease is determined by the initial state of hydration and by the type of exchangeable ion present, ending in a common intercrystalline distance that is only slightly affected by the exchangeable ions.

The phenomenon has now been reinvestigated with NMR wide line techniques leading to the following observations and tentative interpretations.

At high water contents (200 %) an extremely sharp raise in the second moment is observed at 0°C attaining a value that remains approximately constant down to -40°C after which a continuous rise of the second moment value sets in with further decrease of the temperature. This observation is in perfect agreement with the X-ray results.

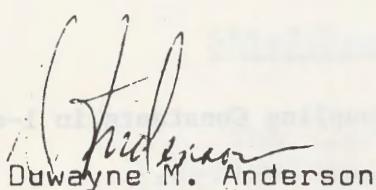
If, however, the clay water content is adjusted by exposure to a relative humidity corresponding to the final intercrystalline distance observed by X-rays in the freezing experiment (26 %) the change in second moment is perfectly continuous and nearly smooth at the passage through the zero point, indicating that no freezing occurs. Above 0°C, the value of the second moment exceeds that of the sample of high water content while below the freezing point the opposite situation occurs. At further temperature decrease the values approach each other and finally coincide.

It appears that the non-freezable water is so firmly attached to the clay lattice that it may be regarded as forming part of the crystalline phase. The difference in behaviour at high and low relative humidities indicates incomplete crystallization

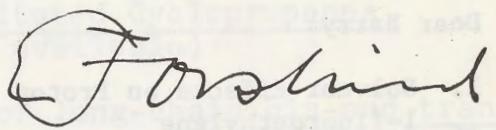
-2-

Dr. Bernard L. Shapiro  
 April 5, 1967

and reduced lattice order in the sample conditioned at low relative humidity, although the average intercrystalline distance corresponds to the well-ordered state. In the case of the samples with high water content, the water expelled from the intercrystalline spaces and freezing after nucleation in the interaggregate free volumes, gives, as expected, a bandwidth too wide to be observable at the spectrometer settings required for the observations mentioned here.



Duwayne M. Anderson



Erik Forslind



## THE UNIVERSITY OF MANITOBA

DEPARTMENT OF CHEMISTRY

WINNIPEG, CANADA

April 4th, 1967

Professor B.L. Shapiro  
 Chemistry Department  
 Illinois Institute of Technology  
 Chicago, Illinois 60616  
 U.S.A.

Dear Barry:

1. Solvent Effects on Proton Shifts and H-H, H-F Coupling Constants in 1-chloro-1-fluoroethylene
2. The Effect of the Acetylenic Group on the Chemical Shift of the Protons in Isopropenylacetylene

I was lucky enough to work with Harold Hutton in the laboratory last summer. Below is a summary of some of our work:

1. The proton chemical shift,  $J_{\text{gem}}^{\text{HH}}$  and  $J_{\text{cis}}^{\text{HF}}$  in  $\text{CH}_2 = \text{CFCl}$  depend primarily on the dielectric constant of the medium, although this dependence is not given by the Onsager reaction field model. A roughly linear relationship is found with the square root of the dielectric constant.  $J_{\text{gem}}^{\text{HH}}$  decreases algebraically while  $J_{\text{cis}}^{\text{HF}}$  increases as the dielectric constant of the medium increases.  $J_{\text{trans}}^{\text{HF}}$  depends on dispersion interactions with the solvent molecules and increases as these interactions increase. The range of observed J values is  $J_{\text{gem}}^{\text{HH}}$  (-3.8 to -4.8 c/s),  $J_{\text{cis}}^{\text{HF}}$  (7.6 to 12.3 c/s),  $J_{\text{trans}}^{\text{HF}}$  (36.9 to 38.6 c/s)
2. The relative signs of the six proton coupling constants in isopropenyl acetylene were found by multiple resonance techniques. The methyl group does not appear to interact with the triple bond via a hyperconjugative mechanism. The ethylenic protons are less shielded than in propene, whereas the opposite is expected on the basis of the anisotropy of the triple bond. This apparent anomaly can be rationalized quantitatively by a model due to Castellano and Lorenc (J. Phys. Chem. 69, 3552 (1965)) and all four proton shifts relative to propene are predicted satisfactorily.

I don't suppose anybody would like to sell an A-60 or A-60A which is still in working condition?

All the best,

Ted Schaefer

## DEPARTMENT OF CHEMISTRY

THE UNIVERSITY OF MICHIGAN • ANN ARBOR, MICHIGAN



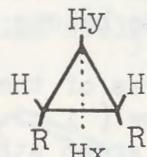
April 7, 1967

Dr. Barry L. Shapiro  
 Department of Chemistry  
 Illinois Institute of Technology  
 Chicago, Illinois

Dear Barry:

Shielding Effects in Substituted Cyclopropanes  
 (Summary-preprint available)

The spectra of a variety of long-chain cis-and trans-1,2-disubstituted cyclopropanes have been described. The long-chain cis-1,2-disubstituted cyclopropanes are of particular interest since this structural unit occurs in a number of diverse natural materials. The cis-isomer is characterized by a multiplet at  $\tau$  10.3, absent in the trans-isomer, and a broad band at about  $\tau$  9.4. The band at  $\tau$  10.3 has been variously assigned to both methylene protons, both methine protons, one of the methine protons, and the methylene proton (Hy) trans to the two substituents. It is clear, however, that the peak in question is due to



the methylene proton (Hx) cis to the substituents. Through the use of the McConnell equation and appropriate structural parameters we calculate that an alkyl group shields a cis-proton by 0.1 to 0.2 ppm and deshields a trans-proton by about the same amount. Examination of the spectra of a large number of cyclopropanes reveals that the shielding effect of an alkyl group is generally greater (ca. 0.25 ppm) than its deshielding effect (ca. 0.1 ppm), on the appropriate protons.

Sincerely yours,

Dan

Daniel T. Longone

DTL:lat

## UNIVERSITY OF BRADFORD

School of Industrial Chemistry  
Bradford 7 Telephone OBR4 29567

Vice-Chancellor and Principal  
E G Edwards PhD FRIC

Please quote ref

Professor B. L. Shapiro,  
Department of Chemistry,  
Illinois Institute of Technology,  
Chicago 16, Illinois.

14th., March , 1967

Dear Professor Shapiro,

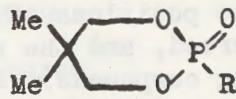
Stereochemistry at phosphorus in 5,5-dimethyl-2-oxo-1,3,2-dioxaphosphorinanes, and effect of benzene on the chemical shifts of the methyl groups.

We have recently reported the  $H^1$  nmr spectra of a number of 5,5-disubstituted-2-oxo- ( and 2-thiono)1,3,2-dioxaphosphorinanes.<sup>1</sup> The data suggest that this system is generally conformationally stable as indicated by, for example, the two signals for the two methyl groups at C-5. Following from studies in the steroid field<sup>2</sup>, the broader of the two peaks was reasonably assumed to belong to the axial methyl group.

Interesting features of the results ( see Table ), are (i) the constancy of position of the narrow ( i.e. equatorial ) peak irrespective of the nature of the exocyclic group attached to phosphorus, and (ii) the relative positions of the broad and narrow peaks for compounds 7,8, and 9, compared with the positions for the remaining compounds. Judging from compounds 4 and 6, this effect cannot be due solely to size of exocyclic group. The feature common to all of 7,8 and 9 would appear to be the presence of at least one benzene ring connected to phosphorus via a single carbon atom; in such cases direct electronic interaction of the  $\pi$ -electron clouds with the phosphoryl bond is not possible. In most of the other cases, interaction of lone electron pairs with the P=O bond is possible.

The conformation of the phosphoryl bond in this type of ring system remains to be decided in general terms, although one structural determination indicates equatorial P=O.<sup>3</sup> The large shielding of axial methyl group in the case of the aralkyl phosphonates does suggest that the exocyclic group here exists more probably in the equatorial position since this would allow an arrangement such as depicted in (I), and while the benzene ring would be free to rotate, it would shield the axial methyl preferentially. Structures such as (II) even if sterically acceptable, and (III), could hardly be expected to display such a pronounced preferential effect.

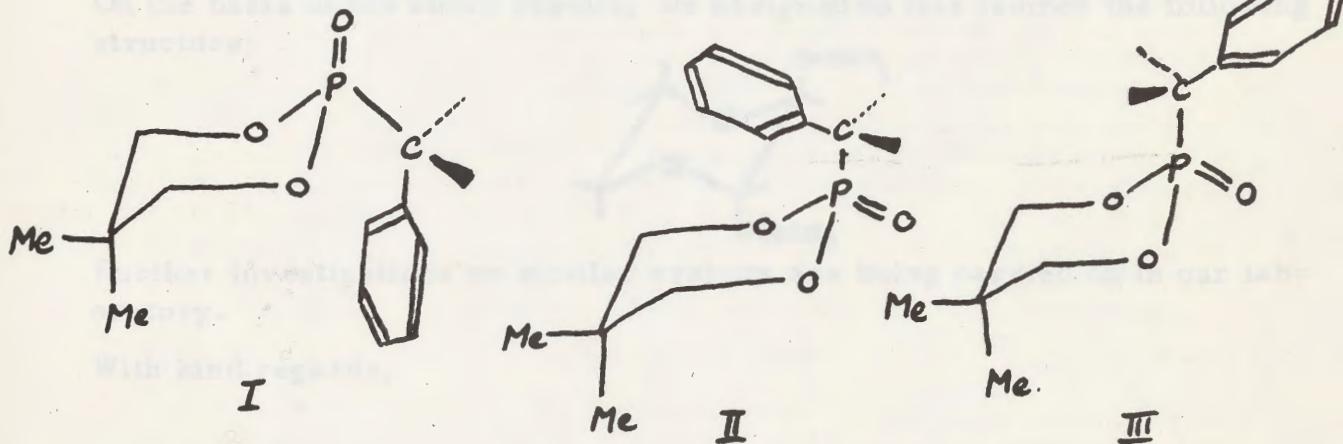
Chemical shifts ( in p.p.m. ) for the gem-dimethyl groups in 5,5-dimethyl-2-oxo-1,3,2-dioxaphosphorinanes.



R	$\delta_{\text{Me}}$ eq. in $\text{CDCl}_3$	$\delta_{\text{Me}}$ ax. in $\text{CDCl}_3$	$\delta_{\text{Me}}$ eq. in PhH	$\delta_{\text{Me}}$ ax. in PhH	$\Delta\delta = \delta_{\text{CDCl}_3} - \delta_{\text{PhH}}$ $\text{Me}_{\text{eq.}}$	$\text{Me}_{\text{ax.}}$
1. OMe	0.90	1.24	0.30	0.91	0.60	0.33
2. OPh	0.97	1.29	0.29	0.94 <sup>a</sup>	0.68	0.35
3. Cl	0.93	1.32	0.17	0.84	0.76	0.48
4. NHBu-tert.	0.98	1.16	0.52	0.86 <sup>b</sup>	0.46	0.30
5. Me	1.01	1.11	0.60	0.74 <sup>b</sup>	0.51	0.37
6. $\text{CCl}_3$	0.99	1.42	0.28	0.95 <sup>a</sup>	0.71	0.47
7. CHMePh	0.90	0.83	0.37	0.57	0.53	0.26
8. CPh <sub>3</sub>	0.98	0.78	0.47	0.51 <sup>a</sup>	0.51	0.27
9. $\text{CH}_2\text{Ph}$	0.95	0.81	0.38	0.50	0.57	0.31

a. containing ca. 10%  $\text{CDCl}_3$

b. " " ca. 20%  $\text{CDCl}_3$



The Table also includes data obtained for benzene solutions ( pure, or because of solubilities, containing small amounts of  $\text{CDCl}_3$  ) of the same compounds. It is to be seen that the positions of the two methyl peaks for compounds 7,8 and 9 are now reversed, and the new positions fall into line with those of the remaining compounds. That this was a true reversal in position rather than a mere interchange of peak widths, was shown by measurements on  $\text{CDCl}_3$  solutions containing increasing amounts of benzene. For compound 7, the peaks reversed when the benzene concentration was ca. 25% v/v.

Yours sincerely,

R.S. Edmundson

R. S. Edmundson

E.W. Mitchell

E. W. Mitchell

1. K.D.Bartle, R.S.Edmundson and D.W.Jones, Tetrahedron, 23,(1967) 1701
2. C.W.Shoppee, F.P.Johnson, R.E.Lack, and S.Sternhell, Chem. Comm.  
(1965) 347.
3. T.A.Beineke, Chem. Comm., (1966) 712.



ISTITUTO DI CHIMICA INDUSTRIALE  
DEL POLITECNICO  
PIAZZA LEONARDO DA VINCI 32 - MILANO

MILANO, 7/4/1967

TELEF. { 292.125 - 292.126  
292.105 - 106 - 107

Prof. Barry L. Shapiro,  
Editor, IIT NMR Newsletter  
Dept. of Chemistry,  
Illinois Institute of Technol.  
Technology Center,  
Chicago, Illinois 60616

Dear Professor Shapiro:

Steric Structure of 2, 3-diacetoxy-dioxane-p

We apologize for not answering your reminder sooner.

We have recently studied the proton spectrum at 100 Mc of one isomer of 2, 3-diacetoxy-dioxane-p (m.p. 105°C). The  $-\text{OCH}_2\text{CH}_2\text{O}-$  fragment absorption is an AA'BB' pattern with the following parameters:

$$J = -12.06$$

$$J_A = 1.22$$

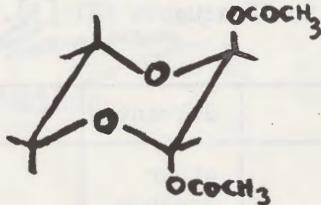
$$J' = 3.15$$

$$J_B = 11.84$$

$$\nu_0 \delta = 57.56$$

The two CH groups give a singlet. The coupling constant between these two protons is < 2 Hz (from  $\text{C}_{13}$  satellites bands).

On the basis of the above results, we assigned to this isomer the following structure:



Further investigations on similar systems are being carried out in our laboratory.

With kind regards,

G. Gatti

F. Fatti

A. Segre

A. Segre

THE QUEEN'S AWARD  
TO INDUSTRY 1966

## Imperial Chemical Industries Limited

DYESTUFFS DIVISION

P.O. Box 42, Hexagon House, Blackley, Manchester, 9

Professor B.L.Shapiro,  
 Department of Chemistry,  
 Illinois Institute of Technology,  
 Chicago 60616,  
 U.S.A.

Your Ref:

Our Ref: ARG/B.5  
 Research Department

10th April, 1967.

Dear Professor Shapiro,

Use of  $^{14}\text{N}$  N.M.R. data in Tautomerism Studies

In previous communications [1,2] we described the double resonance method that we use to obtain  $^{14}\text{N}$  chemical shift data from proton spectra and we discussed the advantages and disadvantages of this method compared to the direct method of observation. Very briefly, the main advantage is the great gain in sensitivity (the  $^{14}\text{N}$  chemical shifts being obtained from the normal dilute solutions used in proton work) and the main disadvantage is that only the chemical shifts of those nitrogen nuclei having detectable coupling to some proton can be measured. Nitrogen is obviously one of the most important elements in the types of organic compound in which this Division deals and the overall aim of our  $^{14}\text{N}$  work is to investigate the possible usefulness of  $^{14}\text{N}$  N.M.R. as a complement to normal proton work in structural and analytical problems. We find that one such area of usefulness is in tautomerism studies.

The  $^{14}\text{N}$  chemical shifts in 2- and 8-hydroxy quinolines can be used as an illustration. The shifts are quoted relative to the nitrate nitrogen of 4.5m  $\text{NH}_4\text{NO}_3$  in 3N aqueous HCl [3].

Compound	Solvent	$^{14}\text{N}$ Chemical Shift p.p.m.
Quinoline (Q)	ether	72 $\pm$ 2 <sup>a</sup>
8-hydroxy-Q	acetone	95 $\pm$ 4
8-hydroxy-5-chloro-Q	"	93 $\pm$ 7
8-hydroxy-7-methyl-Q	"	91 $\pm$ 4
8-hydroxy-5-methyl-Q	"	90 $\pm$ 5
2-hydroxy-Q	$\text{CDCl}_3$	238 $\pm$ 3
2-hydroxy-4-methyl-Q	"	238 $\pm$ 4
2-hydroxy-3-methoxy-Q	"	225 $\pm$ 4
Acetanilide	"	243 $\pm$ 2 <sup>b</sup>

(a) Ref.4

(b) Ref.2

Continued.

The values of the 8-hydroxy-quinolines are typical of those found for  $^{14}\text{N}$  in normal substituted heterocyclic aromatic rings [3]. However the values for the 2-hydroxy-quinolines are widely different and are a clear indication that these compounds exist in the "oxo" rather than the "hydroxy" form. In the "oxo" form the environment of the nitrogen atom will be very similar to that in acetanilide and the shift in this compound is shown for comparison.

Substituted benzothiazoles provide another example. Here the  $^{14}\text{N}$  chemical shifts of the 2-hydroxy and 2-mercapto derivatives are markedly different from other benzothiazoles and show that these compounds exist in the thiazoline rather than thiazole forms. Values for acetanilide and thioacetanilide can be used for comparison here.

Compound	Solvent	$^{14}\text{N}$ Chemical Shift ppm
Benzothiazole (BT)	acetone	60 $\pm$ 2
4-hydroxy-BT	"	66 $\pm$ 8
6 nitro-BT	"	67 $\pm$ 4
2-hydroxy-BT	$\text{CDCl}_3$	243 $\pm$ 2
2-mercapto-BT	acetone	203 $\pm$ 3
Acetanilide	$\text{CDCl}_3$	243 $\pm$ 2
Thioacetanilide	"	210 $\pm$ 3

Many methods have been used to investigate tautomerism in organic nitrogen compounds, including proton N.M.R. spectroscopy, I.R. and U.V. studies, basicity measurements and dipole moment work. These have been reviewed in detail by Katritzky and Lagowski [4]. However, few, if any, of these methods appear to provide such a clear cut distinction between alternative tautomers as the  $^{14}\text{N}$  chemical shifts, where differences of 150-200 p.p.m. are quite common.

Yours sincerely,

P. Hampson

A. Mathias

#### REFERENCES

- [1] P. Hampson and A. Mathias, NMR Newsletter 95, 1, 1966.
- [2] P. Hampson and A. Mathias, Molec. Phys. 11, 541, 1966.
- [3] D. Herbison Evans and R.E. Richards, Molec. Phys. 8, 19, 1964.
- [4] A.R. Katritzky and J.M. Lagowski, Adv. Heterocyclic Chem. 1, 339-437, 1963.

# KARL-MARX-UNIVERSITÄT

## PHYSIKALISCHES INSTITUT

KMU, Physikalisches Institut, 701 Leipzig, Linnéstraße 5

Illinois Institute  
of Technology,  
Department of Chemistry

Chicago, 60616

USA

Ihre Zeichen

Ihre Nachricht vom

Unsere Nachricht vom

Unsere Zeichen

701 LEIPZIG

Linnéstraße 5

Lö/Sw.

16 February 1967

Betrifft

Dear Professor Shapiro :

In reply to your kind admonishment of January 12, 1967, I wish to give a report of our NMR-shift measurements of In in III-V-compounds. Lüttgemeier yielded in 1964 from purest material results of utmost interest, and there is no doubt now that they are owing to chemical shifts. To what an extent Knight shifts occur in semiconductors has been not wholly veryfied then. We found for InSb and InAs additional shifts depending on the impurity concentration and which have according to our last investigations quite the nature of a Knight shift caused by conduction electrons. For a sample with about  $10^{19}$  impurities per  $\text{cm}^3$  we got, for example,  $K = 2,1 \cdot 10^{-4}$ . Applying the Day shift data measured by Guereon in similar substances one can therewith evaluate the electron density and obtains values being plausible also by other methods.

The Knight shift in the examined probes is about a factor 2 to 10 smaller than the chemical shift so that the latter prevails on the whole. The measurements are inconvenient since the conductivity of these In compounds depend on the magnetic field and on the shape and size of the sample. With a spectrometer working with field modulation only measurements can be performed with powder the conductivity changes of which are negligible. Studies of monocrystals with frequency modulation are planned in the near future.

Of course, there is perhaps reason to believe that the observed shift might be due to quadrupole perturbations of second order. This seems, however, impossible since then also a sensible shift of the line intensity and the line width, respectively, ought to be observable.

We did not investigate those shifts in other compounds, and we are highly interested to learn whether the co-readers of IIT-NMR Newsletters are effectuating experiments in this field.

Yours sincerely,

A. Lösche  
(Prof.Dr.A.Lösche)

## THE JOHNS HOPKINS UNIVERSITY

SCHOOL OF MEDICINE

725 N. WOLFE STREET · BALTIMORE, MARYLAND 21205

DEPARTMENT OF PHYSIOLOGICAL CHEMISTRY

TELEPHONE 955-5000  
AREA CODE 301

April 14, 1967

Professor B. L. Shapiro  
 Department of Chemistry  
 Illinois Institute of Technology  
 Technology Center  
 Chicago, Illinois 60616

Dear Barry:

Since I last contributed to the newsletter, we have completed an initial survey of the effects of the enzymes yeast alcohol dehydrogenase and equine liver alcohol dehydrogenase on the NMR spectra of NAD, NADH, ethanol and acetaldehyde. Since the results will appear soon in Biochemistry I won't present any details here.

More recently along with R. L. Biltonen, who joined this Department last summer, I have been collaborating on a quantitative NMR study of the reversible thermal denaturation reaction of several proteins of the chymotrypsinogen family. We have followed the unfolding transition of  $\alpha$ -chymotrypsin quantitatively by monitoring the NMR intensity and linewidth in the region where the methyl of leucine, isoleucine and valine appear. By comparing the NMR data with U. V. data which follows this transition accurately, we have concluded that NMR and U. V. are following the same transition. Having established this we examined several chymotrypsin derivatives whose degree of unfolding in their native or best folded states are different according to thermodynamic data. The NMR spectra confirm these differences quite clearly and agree quantitatively with the thermodynamic results. These results will be published in detail in the near future.

With best regards,

Sincerely,

*D. P. Hollis*

D. P. Hollis  
 Assistant Professor

PRINCETON UNIVERSITY  
DEPARTMENT OF CHEMISTRY  
PRINCETON, NEW JERSEY 08540

Frick Chemical Laboratory

April 13, 1967.

Reconsideration of the tetramethylsilane internal reference.

Dear Barry,

The exact determination of proton chemical shifts for a molecule in principle requires that measurement be performed at infinite dilution in the gas phase. For convenience most studies have used liquid phase data. Two techniques are possible. Use of an external reference eliminates the intermolecular interactions involving the reference compound, but demands a considerable accuracy in the determination of magnetic susceptibilities. If chemical shifts are desired within  $10^{-2}$  ppm, the values of the susceptibilities ought to be determined with better than 0.25 % relative accuracy, and this is unattainable by nmr determinations<sup>1,2</sup>. Therefore, the universal procedure is the recourse to tetramethylsilane (TMS) as an internal reference. In addition to other convenient features, TMS was chosen<sup>1</sup> upon the assumptions that it is chemically inert, and that internal referencing removes the non-specific Van der Waals contributions to nuclear shielding, arising from dispersion forces in the liquid<sup>3</sup>.

We report here experiments designed to test these assumptions, in collaboration with Drs. Jacques Reisse and Robert Ottinger, Université Libre de Bruxelles.

Solutions containing 1 % w/v of a 1:1 mixture of an hydrocarbon solute and TMS were examined in a series of solvents, and the chemical shifts of the methylene and methyl resonances were measured with respect to TMS by the audio sideband technique (Table 1). Their interpretation should follow readily from the data presented, specially since I am trying to beat your deadline.

As for the supersession of TMS, to write like the scrutinizing Dr. F.R. Leavis, the answer is a matter of personal judgement and individual solvents.

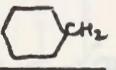
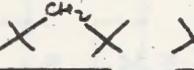
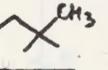
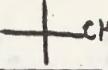
Sincerely yours,

Pierre Laszlo

Arnold Speert

- (1) G.V.D.Tiers, J.Phys.Chem., 62, 1151 (1958).
- (2) C.Lussan, J.Chim.Phys., 61, 462 (1964).
- (3) P.Laszlo "Solvent Effects and Nuclear Magnetic Resonance", in Progress in Nuclear Magnetic Resonance Spectroscopy, J.W.Emsley, J.Feeney, and L.H.Sutcliffe, Eds., vol.3 (in press), and references herein cited.

Table 1.

Solvent	$\epsilon_{25^\circ}$	$\mu_D$					CH <sub>3</sub> (Hz from TMS at 60 MHz, $\pm$ 0.3 Hz, 40°C)
1,4-dioxane	2.21	0.4	85.8	77.4	58.9	55.3	
CCl <sub>4</sub>	2.23	0	85.8	75.5	58.8	55.6	
C <sub>6</sub> H <sub>6</sub>	2.27	0	84.3	74.8	58.6	54.3	
CS <sub>2</sub>	2.64	0	85.1	74.2	57.1	54.6	
CDCl <sub>3</sub>	4.70	1.1	85.8	76.0	58.6	55.2	
PhNH <sub>2</sub>	6.98	1.5	83.8	72.8	57.6	53.0	
CH <sub>2</sub> Cl <sub>2</sub>	8.9	1.6	86.2	76.6	58.7	55.0	
C <sub>5</sub> H <sub>5</sub> N	12.3	2.2	80.9 <sup>c</sup>	73.0 <sup>a,b</sup>	56.8 <sup>a,b</sup>	52.1	
PhCHO	17.8	2.9	80.0	70.4	54.7	52.0	
Me <sub>2</sub> CO	20.5	2.7	85.8	77.8	59.2	55.5	
PhCN	25.2	3.9	80.8	70.5	54.4	52.0	
OP(NMe <sub>2</sub> ) <sub>3</sub>	29.6	5.4	85.2	75.7	58.8	55.0	
MeOH	32.6	1.65	87.1	77.3	59.2	55.4	
PhNO <sub>2</sub>	34.6	4.0	81.5	69.6	53.6	51.9	
MeCN	37.5	3.5	86.1	77.1	59.1	55.5	
Me <sub>2</sub> NCHO	36.7	3.8	84.4	76.0	58.5	54.4	
Me <sub>2</sub> SO	48.9	3.9	84.4	74.9	57.6	-	

<sup>a</sup> 71.0 and 56.0 (4.5°), 70.4 and 55.3 (-15.5°), 68.4 and 54.8 (-33.5°).

<sup>b</sup> 74.8 and 57.8 in a 1:1 v/v carbon tetrachloride-pyridine mixture.

<sup>c</sup> 79.2 (4.5°), 78.4 (-15.5°), 77.8 (-33.5°).

# Monsanto C O M P A N Y

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ORGANIC CHEMICALS DIVISION

1700 South Second Street  
St. Louis, Missouri 63177  
(314) MAin 1-4000

April 10, 1967

Dr. B. L. Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Chicago, Illinois 60616

Dear Dr. Shapiro:

### A-60 Recorder Modifications

We recently completed two A-60 Varian high impedance recorder modifications which have proven useful and would like to pass these along to other IITNMR readers. A second set of sweep widths has been added, allowing spectra to be obtained at 25, 10 or 5 cps full scale, in addition to the existing sweep widths. Also, the recorder sweep time options were changed from 25, 50, 100, 250 or 500 seconds full scale to 100, 200, 400, 1,000 or 2,000 seconds full scale. Potentiometer adjustments and sweep motor interchange are not required after installation. We feel this is an advantage over similar recorder modifications reported previously, MELLONMR 51, 19 (1963) and IITNMR 78, 27 (1965).

Details of the sweep width scale expansion are given in the schematic which follows. Required parts are 15.4K and 124.K 1/2 watt, 1% resistors and a D.P.D.T. toggle switch. The switch is mounted on the side of the console within easy reach of the operator. In one position, the existing sweep widths are maintained; i.e., 50, 100, 250, 500 or 1,000 cps full scale. In the other position, all sweep ranges are reduced by an exact factor of 10, giving widths of 5, 10, 25, 50 or 100 cps full scale. The values were verified by the audio side band technique. Standard A-60 paper permits easy measurement on the new scales.

The primary purpose of the sweep time change was to provide the slower scanning rates needed to obtain optimum resolution. The loss of the rapid 25 and 50 second sweep rates was felt to be unimportant since these were used infrequently. For this change, the 25 rpm slow sweep motor is replaced with the equivalent 6 rpm motor (Bodine KYC 22RC frame type, B-8122E-300C, 6 rpm, \$37.80). Also, the 40, 65 and 50-tooth gears are replaced with 50, 55 and 60-tooth gears, respectively. These gears are available from Pic Design Corporation: Pic G3-55, 55 tooth, \$3.70, and Pic G3-60, 60 tooth, \$3.80. This gear change, which is optional, is used to give integral sweep times.

Dr. B. L. Shapiro

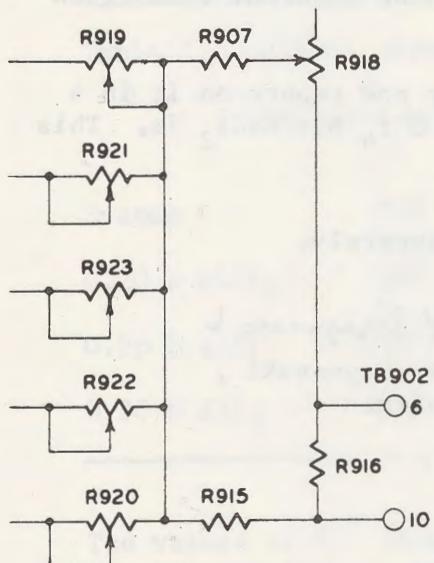
- 2 -

The effect of the longer sweep times and scale expansion on resolution will depend on the overall stability of the individual A-60 system. Typical line widths we have obtained for the TMS peak (full line width at 1/2 maximum peak height), together with our best values to date are given in Table I. The values for 400 sec. at 50 cps are typical of the performance of our instrument before modification. The longer sweep times consistently give improved resolution. The effect of scale expansion is less significant and is also somewhat less reproducible. However, the expanded scales are quite useful in obtaining broader peaks for planimeter area measurements.

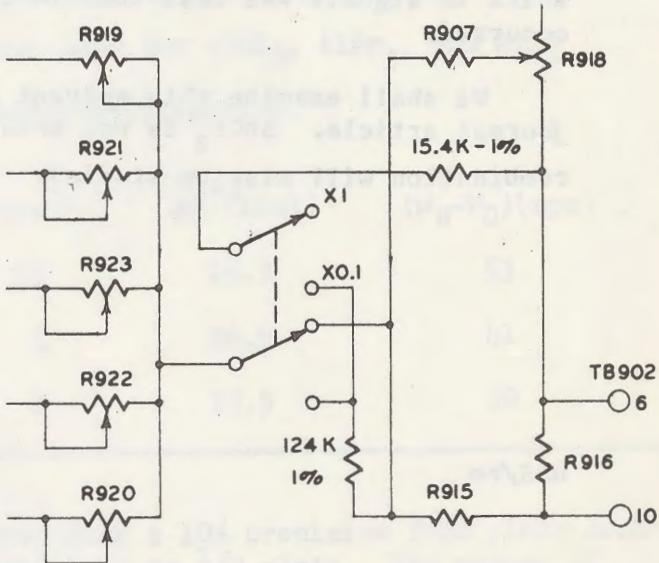
TABLE I. TMS LINE WIDTH (cps)

Sweep Time (Sec.)	Typical		Best	
	Sweep Width		Sweep Width	
	50 cps	25 cps	50 cps	25 cps
400	.35	.29	.35	.26
1000	.30	.26	.28	.20
2000	.27	.24	.23	.15

## RECORDER SWEEP CIRCUIT



a) Original circuit



b) Modified for scale expansion

*Martin W. Dietrich, Robert E. Keller, Walter N. Trumpe*  
Sincerely, Martin W. Dietrich, Robert E. Keller, Walter N. Trumpe



## CANISIUS COLLEGE

BUFFALO, NEW YORK 14208

## DEPARTMENT OF CHEMISTRY

April 11, 1967

B.L. Shapiro  
 Chemistry Department  
 Illinois Institute of Technology  
 Chicago, Ill. 60616

Dear Dr. Shapiro:

As a contribution to the IIT Newsletter I would like to report a method we used to increase the solubility of a number of drugs in  $\text{CDCl}_3$  and  $\text{CS}_2$ . Our problem arose when the solubility was such that our signals were nearly lost in the noise. To increase solubility we added 5-10% of  $\text{SbCl}_3$  to each of these solvents. The shift in signals was less than 10 cps. and no apparent distortion occurred.

We shall examine this solvent further and report on it in a journal article.  $\text{SbCl}_3$  is not soluble in  $\text{CCl}_4$  but  $\text{AsCl}_3$  is. This combination will also be studied.

Sincerely,

*H.A. Szymanski*  
 H.A. Szymanski,  
 Chairman

HAS/rm

## CALIFORNIA STATE COLLEGE

AT LOS ANGELES



Department of Chemistry

5151 State College Drive, Los Angeles, California 90032  
(San Bernardino and Long Beach Freeways Interchange)

April 11, 1967

Professor B. L. Shapiro  
Department of Chemistry  
Illinois Institute of Technology  
Chicago, Illinois 60616

Dear Barry:

Solvent Exchange Study for DMF Complexes

As has been recently demonstrated (1-3), solutions of  $\text{AlCl}_3$  in several solvents, notably DMF, NMF, and DMSO, give rise to two sets of n.m.r. signals, corresponding to the bulk and complexed organic solvent molecules. Using an A60, we recently completed a preliminary temperature study of DMF complexes with  $\text{AlCl}_3$ ,  $\text{AlBr}_3$ , and  $\text{AlI}_3$ , enabling us to determine rate constants and activation energies for solvent exchange in these systems. A few of the data are listed below.

Table I. Solvent Exchange Rate Data for  $\text{AlCl}_3$ ,  $\text{AlBr}_3$ , and  $\text{AlI}_3$   
Complexes with N,N-Dimethylformamide.

System	T°K	k(sec <sup>-1</sup> )	$\Delta H^\ddagger$ (Kcal)	$(\nu_B - \nu_C)$ (cps)
0.20 M $\text{AlCl}_3$	298	13	15.3	53
0.26 M $\text{AlBr}_3$	298	1	16.6	41
0.20 M $\text{AlI}_3$	298	1	17.5	30

The values of  $\Delta H^\ddagger$  were measured with a 10% precision from plots such as those of Fig. 1, essentially  $\ln k$  vs  $1/T$  plots. The values of  $\nu_B - \nu_C$  are the separation between the bulk ( $\nu_B$ ) and complexed ( $\nu_C$ ) formyl proton signals. Although the assumption must be made with caution, these separations may reflect the strength of the complex. If so, the rate determining step for exchange may involve primarily diffusion rather than the breaking of the Al(III)-DMF linkage in the complex. A similar mechanism has been postulated for solvent exchange in the  $\text{Al}(\text{ClO}_4)_3$ -DMSO system<sup>(2)</sup> so this may be reasonable. These complexes, and others, are now being studied in other solvents to clarify the mechanism. A few preprints of this study are available.

1. A. Fratiello and D. P. Miller, Mol. Phys., 11, 37(1966).
  2. S. Thomas and W. L. Reynolds, J. Chem. Phys., 44, 3148(1966).
  3. A. Fratiello, R. Schuster, and D. P. Miller, Mol. Phys., 11, 597(1966).

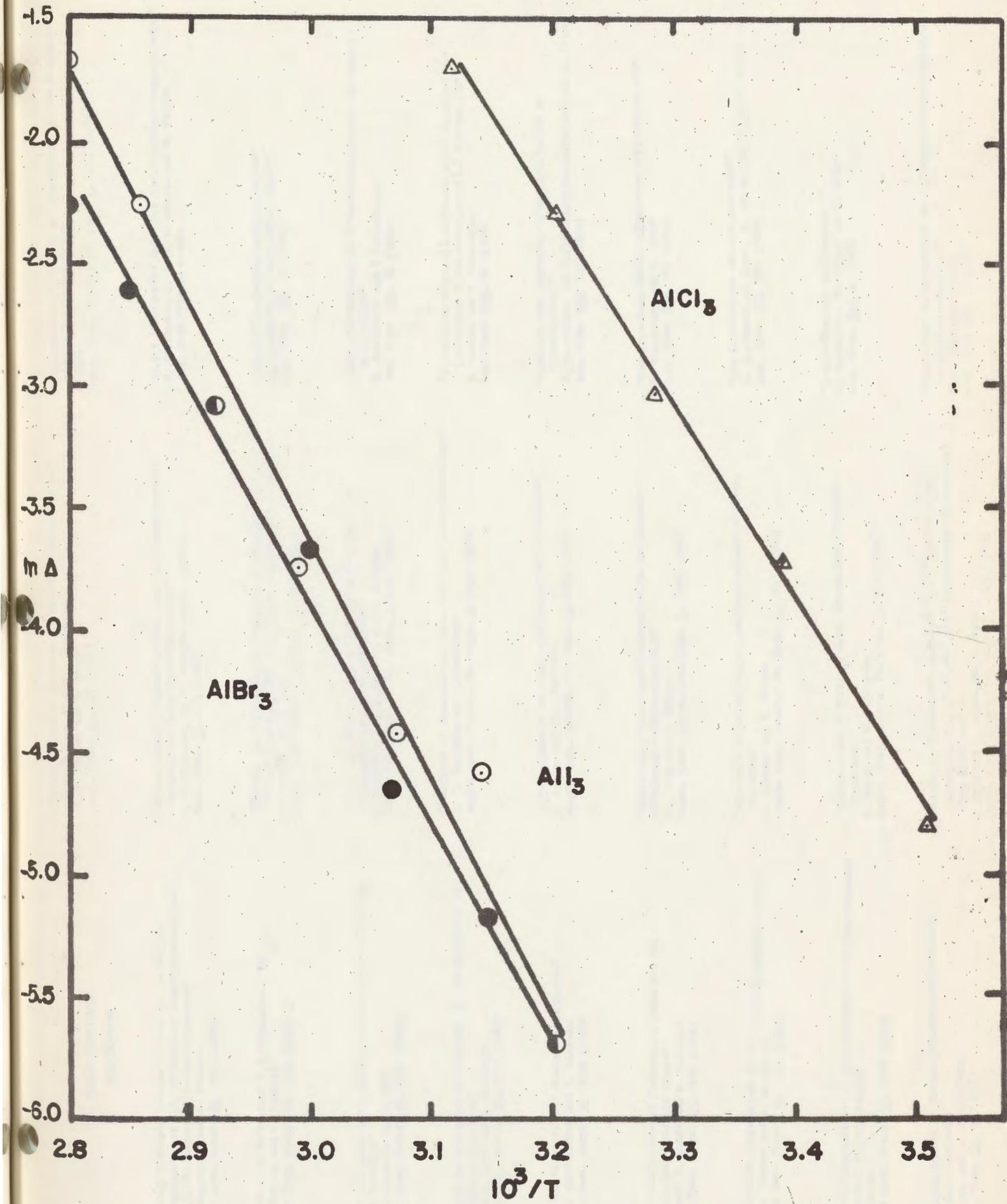
Sincerely,

Tay Fratiello  
Anthony Fratiello

Ronald Schuster

AF/sn

Ronald Schuster



MELLON INSTITUTE  
BIBLIOGRAPHY

"Primary Hydrogen Isotope Effects in the Nuclear Bromination of 1,3,5-Trimethoxy-2-methylbenzene and 1,3,5-Trimethoxy-2,4-dimethylbenzenes"  
E. Helgstrand and A. Nilsson  
Acta Chem. Scand. 20, 1463 (1966)

"Studies on Methylated 1,2,3-Triazoles. II"  
M. Begtrup and C. Pedersen  
Acta Chem. Scand. 20, 1555 (1966)

"The Ring Opening of Aromatic O-Heterocycles by Sodium in Pyridine"  
J. Gripenberg and T. Hase  
Acta Chem. Scand. 20, 1561 (1966)

"Thiophene Analogues of Indenes. I. The Synthesis of Indanone Analogues"  
O. Meth-Cohn and S. Gronowitz  
Acta Chem. Scand. 20, 1577 (1966)

"On the Metabolism of Fusidic Acid in Man"  
W. O. Godteredsen and S. Vangedal  
Acta Chem. Scand. 20, 1599 (1966)

"The Constitution of Fluorescein Oxime and the Hydroquinonephthalain Oximes"  
H. Lund, P. Lunde and F. Kaufmann  
Acta Chem. Scand. 20, 1631 (1966)

"Selective Preparation of the Lutein Monomethyl Ethers"  
S. L. Jensen and S. Hertzberg  
Acta Chem. Scand. 20, 1703 (1966)

"Algal Carotenoids. V. Iso-fucoxanthin — a Rearrangement Product of Fucoxanthin"  
A. Jensen  
Acta Chem. Scand. 20, 1728 (1966)

"Chemical Shifts of Protons in Nitrogen-Containing Organic Compounds"  
G. Slomp and J. G. Lindberg  
Anal. Chem. 39, 60 (1967)

"Determination of Fluoride in Aluminum Fluoride by Wide Line Nuclear Magnetic Resonance"  
W. P. Ferren and N. Shane  
Anal. Chem. 39, 117 (1967)

"Esterification, Identification, and Gas Chromatographic Analysis of Krebs Cycle Keto Acids"  
P. G. Simmonds, B. C. Pettitt and A. Zlatkis  
Anal. Chem. 39, 163 (1967)

"Thermal and Photochemical Formation of Phospholenes and Tetrahydrophosphorins from Cyclophosphines and Dienes"  
U. Schmidt and I. Boie  
Angew. Chem. Intern. Ed. Engl. 5, 1038 (1966)

"A New Synthesis of the Oxepin System from Furan and Dimethyl Acetylenedicarboxylate"  
H. Prinzbach, M. Arguelles, and E. Druckrey  
Angew. Chem. Intern. Ed. Engl. 5, 1039 (1966)

"Reactions of Benzonitrile Oxide with Alkylidene phosphoranes"  
H. J. Bestmann and R. Kunstmann  
Angew. Chem. Intern. Ed. Engl. 5, 1039 (1966)

"1,5-Cyclization of Vinyl-substituted Sulfur Diimides"  
G. Kresze and Chr. Seyfried  
Angew. Chem. Intern. Ed. Engl. 5, 1042 (1966)

"Substituted Pyrimidine-5-carbonitriles by Vilsmeier Reaction of Malonodinitrile"  
Ch. Jutz and W. Müller  
Angew. Chem. Intern. Ed. Engl. 5, 1042 (1966)

"Structure of Tricarbonyl-1,-methanocyclodecapentaene-chromium"  
H. Günther and W. Grimmel  
Angew. Chem. Intern. Ed. Engl. 5, 1043 (1966)

"Introduction of Tertiary Alkyl Groups into CH-Acidic Compounds"  
P. Boldt and W. Thielecke  
Angew. Chem. Intern. Ed. Engl. 5, 1044 (1966)

"Isolation of Tetracyclo[6.3.1.0<sup>2,6</sup>]dodecane and Pentacyclo[7.3.1.4,12,0<sup>2,7,10,11</sup>]tetradecane (Diamantane) from Petroleum"  
S. Hala and S. Landa and V. Hanus  
Angew. Chem. Intern. Ed. Engl. 5, 1045 (1966)

"N-Thioaniline, C<sub>6</sub>H<sub>5</sub>N=S, as Intermediate in the Decomposition of N,N-Thiodianiline"  
P. Tavs  
Angew. Chem. Intern. Ed. Engl. 5, 1048 (1966)

"7.8;9.10-Dibenzo- und 7.8.9.10-Tetraphenyl-sesquifulvalene"  
H. Prinzbach, D. Seip, L. Knothe und W. Faisst  
Ann. Chem. 698, 34 (1966)

"8-Benzyl-9.10-benzo-sesquifulvalene"  
H. Prinzbach, D. Seip und G. Englert  
Ann. Chem. 698, 57 (1966)

"Wittig-Umlagerung von [9-Lithium-fluorenyl-(9)-methyl-allyl-athern]"  
U. Schollkopf und K. Fellenberger  
Ann. Chem. 698, 80 (1966)

"1,4-Dichlor-bicyclo[2.2.0]hexan durch Photolyse von 1,4-Dichlor-2,3-diaza-bicyclo[2.2.2]octen-(2)"  
W. Luttke und V. Schabacker  
Ann. Chem. 698, 86 (1966)

"Addition von 5-Methylen- $\Delta^3$ -pyrrolonen-(2) an Pyrrolderivate"  
H. Plieninger und Ulrich Lerch mitbearbeitet von A. Tapia  
Ann. Chem. 698, 191 (1966)

"Totalsynthese zweier racemischer Stercobiline-IXo"  
H. Plieninger und U. Lerch  
Ann. Chem. 698, 196 (1966)

"Die Konstitution des Actinorhodins"  
H. Brockmann, A. Zeeck, K. van der Merwe und W. Müller  
Ann. Chem. 698, 209 (1966)

"Olefin-Komplexe des Nickels(0)"  
B. Bogdanovic, M. Kröner und G. Wilke  
Ann. Chem. 699, 1 (1966)

"Kinetischer Isotopeneffekt der 1,5-Wasserstoffverschiebung im *cis*-Pentadien-(1,3)"  
W. R. Roth und J. König  
Ann. Chem. 699, 24 (1966)

"The Thermal Rearrangement of 1,5-Hexadiyne and Related Compounds"  
W. D. Huntsman and Harry J. Wristers  
J. Am. Chem. Soc. 89, 342 (1967)

"Anomalous Reductions of 7-Substituted Norbornadienes with Diimide"  
W. C. Baird, Jr., B. Franzus, and J. H. Surridge  
J. Am. Chem. Soc. 89, 410 (1967)

"Carbon-13 NMR of Paramagnetic Iron-Group Cyanides"  
D. G. Davis and R. J. Kurland  
J. Chem. Phys. 46, 388 (1967)

"Nuclear Magnetic Resonance Spectra and Nitrogen Inversion in 1-Acylaziridines"  
F. A. L. Anet and J. M. Osyany  
J. Am. Chem. Soc. 89, 352 (1967)

"Electrophilic Substitution at Saturated Carbon. XXXI. Effects of Attached Second-Row Elements on the Rates of Nitrogen Inversion in Aziridines"  
F. A. L. Anet, R. D. Trepka, and D. J. Cram  
J. Am. Chem. Soc. 89, 357 (1967)

" $\alpha$ -Lactams. IV. A Stable  $\alpha$ -Lactam, I, 3-Di-*tert*-butylazidinone"  
J. C. Sheehan and J. H. Beeson  
J. Am. Chem. Soc. 89, 362 (1967)

" $\alpha$ -Lactams. V. The Pyrolysis and Nucleophilic Cleavage of Spiro- $\alpha$ -lactams"  
J. C. Sheehan and J. H. Beeson  
J. Am. Chem. Soc. 89, 366 (1967)

"Substituent Effects. VII. The F Nuclear Magnetic Resonance Spectra of Substituted 1-and 2-Fluoronaphthalenes  
W. Adcock and M. J. S. Dewar  
J. Am. Chem. Soc. 89, 379 (1967)

"Substituent Effects. IX. H and F Nuclear Magnetic Resonance Spectra of 4-Substituted 3,5-Dimethylfluorobenzenes"  
M. J. S. Dewar and Y. Takeuchi  
J. Am. Chem. Soc. 89, 390 (1967)

"Nucleosides. XXXVIII. Proton Magnetic Resonance Studies of Acetylated Nucleosides"  
R. J. Cushey, K. A. Watanabe, and J. J. Fox  
J. Am. Chem. Soc. 89, 394 (1967)

"Bridged Polycyclic Compounds. XLIV. Stereochemistry of Cycloprpane Ring Formation from Substituted Dibenzobicyclo[3.2.1.]octadienes"  
S. J. Cristol and B. B. Jarvis  
J. Am. Chem. Soc. 89, 401 (1967)

"Bicyclo[2.1.1]hexane. Preparation and Photochlorination"  
R. Srinivasan and F. I. Sonntag  
J. Am. Chem. Soc. 89, 407 (1967)

"Synthesis of  $\alpha$ -Silyl Ketones via I,3-Ditianes"  
E. J. Corey, D. Seebach, and R. Freedman  
J. Am. Chem. Soc. 89, 434 (1967)

"The Isolation and Structural Elucidation of Euparotin Acetate, a Novel Guianolide Tumor Inhibitor from Eupatorium rotundifolium"  
S. M. Kupchan, J. C. Hemingway, J. M. Cassady, J. R. Knox, A. T. McPhail, and G. A. Sim  
J. Am. Chem. Soc. 89, 465 (1967)

"(3)-1,2-Dicarbollyl Complexes of Nickel (III) and Nickel (IV)"  
L. F. Warren Jr.; M. Frederick Hawthorne  
J. Am. Chem. Soc. 89, 470 (1967)

"2,4-Bis-( $\beta$ -hydroxypropionic Acid) Deuteroporphyrinogen IX, a Possible Intermediate between Coproporphyrinogen III and Protoporphyrin IX"  
S. Sano  
J. Biol. Chem. 241, 5276 (1966)

"1 $\beta$ -Hydroxylation of 3 $\alpha$ , 17 $\alpha$ , 20 $\beta$ , 21-Tetrahydroxy-5 $\beta$ -pregnan-11-one and of Other 5 $\beta$ -Steroids in a Man and by Surviving Liver Slices of the Guinea Pig"  
J. J. Schneider and N. S. Bhacca  
J. Biol. Chem. 241, 5313 (1966)

"Isolation, Characterization, and Synthesis of 3 $\alpha$ -Ureido-11 $\beta$ -Hydroxy- $\Delta^4$ -androst-17-one"  
D. K. Fukushima, S. Noguchi, H. L. Bradlow, B. Zumoff, K. Kozuma, and L. Hellman, and T. F. Gallagher  
J. Biol. Chem. 241, 5336 (1966)

"Chemical-Shift Data for Water and Aqueous Solutions"  
H. H. Rüterjans and H. A. Scheraga  
J. Chem. Phys. 45, 3296 (1966)

"Analysis of the NMR Spectrum of Pyridine"  
S. Castellano, C. Sun, and R. Kostelnik  
J. Chem. Phys. 46, 327 (1967)

"Application of Low-Field NMR to the Unambiguous Assignment of Spin-Coupling Parameters. I. Pentafluoro-Iodobenzene"  
W. B. Moniz and E. Lustig  
J. Chem. Phys. 46, 366 (1967)

"Comment: Determination of Hydration Numbers of Cations in Aqueous Solution by Means of Proton NMR"  
S. Meiboom  
J. Chem. Phys. 46, 410 (1967)

"Reply to S. Meiboom Re: Determination of Hydration Numbers of Cations in Aqueous Solution by Means of Proton NMR"  
T. J. Swift and W. G. Sayre  
J. Chem. Phys. 46, 410 (1967)

"Phosphorus-Nitrogen Compounds. Part XXII. The Reactions of Hexachlorocyclotriphosphazatriene with Isopropylamine"  
S. K. Das, R. Keat, R. A. Shaw, and B. C. Smith  
J. Chem. Soc., A, Inorg. Phys. Theor. 1677 (1966)

"Phosphorus-Nitrogen Compounds. Part XXIII. Dimethyl-aminophenoxycyclotriphosphazatrienes"  
D. Dell, B. W. Fitzsimmons, R. Keat, and R. A. Shaw  
J. Chem. Soc., A, Inorg. Phys. Theor. 1680 (1966)

"Transition Metal-Carbon Bonds. Part VII. The Formation of -Allylic-Palladium Complexes from Allenes and Palladium Halides and the Reversed Reactions"  
M. S. Lupin, J. Powell, and B. L. Shaw  
J. Chem. Soc., A, Inorg. Phys. Theor. 1687 (1966)

" $^{195}\text{Pt}$ - $^{31}\text{P}$  Nuclear Spin Coupling Constants and the Nature of the *trans*-Effect in Platinum Complexes"  
A. Pidcock, R. E. Richards, and L. M. Venanzi  
J. Chem. Soc., A, Inorg. Phys. Theor. 1707 (1966)

"The Preparation and Properties of Tris(triphenylphosphine)halogenorhodium(I) and Some Reactions thereof including Catalytic Homogeneous Hydrogenation of Olefins and Acetylenes and their Derivatives"  
J. A. Osborn, F. H. Jardine, J. F. Young and G. Wilkinson  
J. Chem. Soc., A, Inorg. Phys. Theor. 1711 (1966)

"Interaction of Tris(triphenylphosphine)chlororhodium(I) with Iodomethane, Methylallyl, and Allyl Chloride"  
D. N. Lawson, J. A. Osborn, and G. Wilkinson  
J. Chem. Soc., A, Inorg. Phys. Theor. 1733 (1966)

"Tris(triphenylarsine)- and Tris(triphenylstibine)-chlororhodium(I) Complexes and their Reactions with Hydrogen, Olefins, and Other Reagents"  
J. T. Magie and G. Wilkinson  
J. Chem. Soc., A, Inorg. Phys. Theor. 1737 (1966)

"Part I. Synthesis of  $\alpha$ -Methylene- $\gamma$ -Butyrolactones.  
Part II. The Structure and Total Synthesis of  
Alantolactone"  
N. Cohen  
Dissertation Abstr., B, Sci. Eng. 27, 99 (1966)

"Bicyclo[1.1.1]Pentane"  
D. S. Connor  
Dissertation Abstr., B, Sci. Eng. 27, 100 (1966)

"Preparation of Some Stereospecifically Deuterated  
Clovane and Caryolane Derivatives"  
F. Y. Edamura  
Dissertation Abstr., B, Sci. Eng. 27, 103 (1966)

"Studies in the Syntheses of Furanoterpenes"  
J. W. Ellis  
Dissertation Abstr., B, 27, 104 (1966)

"Part I. Synthesis and Stereochemistry of Fichtelite.  
Part II. Structure and Stereochemistry of Some Re-  
duction Products of Abietic-Type Resin Acids"  
J. N. Marx  
Dissertation Abstr., B, Sci. Eng. 27, 109 (1966)

"Mechanistic Study of Dichlorocarbene Insertion into  
The Carbon-Mercury Bond. Thermal Decomposition of  
the Carbon-Mercury Insertion Product"  
R. D. Mathis  
Dissertation Abstr., B, Sci. Eng. 27, 110 (1966)

"Gambit in a Gelsemine Synthesis"  
F. C. Tahk  
Dissertation Abstr., B, Sci. Eng. 27, 118 (1966)

"Nuclear Magnetic Resonance of Nitrogen-14 in Potassium  
Azide"  
R. A. Forman  
Dissertation Abstr., B, Sci. Eng. 27, 273 (1966)

"Nuclear Magnetic Resonance in Antiferromagnets"  
V. J. Minkiewicz  
Dissertation Abstr., B, Sci. Eng. 27, 277 (1966)

"Spin Lattice Relaxation Processes in Magnetically Dilute  
Manganese-Zinc Silicofluoride"  
B. C. Thompson  
Dissertation Abstr., B, Sci. Eng. 27, 280 (1966)

"Synthesis of Compounds Containing the Trifluoromethane-  
sulfonate and Fluorosulfate Groups"  
R. E. Noftle  
Dissertation Abstr., B, Sci. Eng. 27, 396 (1966)

"A Nuclear Magnetic Resonance Study of Some Aminohalo-  
phosphines"  
W. VanDoorn  
Dissertation Abstr., B, Sci. Eng. 27, 397 (1966)

"7-Aryl-7-Bicyclo[2.2.1]Heptyl Derivatives: Syntheses,  
Solvolyses, and  $pK_{R^+}$  Measurements"  
A. F. Breazeale  
Dissertation Abstr., B, Sci. Eng. 27, 401 (1966)

"The Chemistry of 1,2,5-Thiadiazole and the -N=S=N-  
Bond System"  
G. R. Collins  
Dissertation Abstr., B, Sci. Eng. 27, 403 (1966)

"Organophosphides as Nucleophilic Agents" Retention of  
Configuration in Vinylid Halide Substitution"  
D. J. Daigle  
Dissertation Abstr., B, Sci. Eng. 27, 404 (1966)

"The Chemistry of 3,7-Disubstituted Octahydro-1,5-Diazocines"  
G. R. Gapski  
Dissertation Abstr., B, Sci. Eng. 27, 406 (1966)

"1. Correlations of Electronic Effects of Substituents  
with N.M.R. Spectra. 2. Addition Reactions of *cis*,  
*trans*-1,5-Cyclodecadiene and *cis*- and *trans*-Cyclodecene"  
G. A. Knesel  
Dissertation Abstr., B, Sci. Eng. 27, 412 (1966)

"Cycloaddition Reactions of the N-Sulfinyl and Nitrone  
Functional Groups"  
A. Macaluso  
Dissertation Abstr., B, Sci. Eng. 27, 413 (1966)

"Some Aspects of the Chemistry of Ferruginol-Type Diter-  
penes and Proton Magnetic Resonance Characteristics of  
Diterpenic Substances"  
J. D. McChesney  
Dissertation Abstr., B, Sci. Eng. 27, 414 (1966)

"On the Question of Photo-Induced Heterolytic Carbon-  
Oxygen Cleavage Reactions"  
E. D. A. Flank  
Dissertation Abstr., B, Sci. Eng. 27, 415 (1966)

"I: The Components of Nymphaea Odorata. II. A Study  
of a Novel Nitrile Alkylation"  
A. Segal  
Dissertation Abstr., B, Sci. Eng. 27, 419 (1966)

"I. Polyazonia Aromatic Systems. II. Base Reactions of  
Acridizinium Salts. Opening and Closing of the Ring"  
J. P. Sherer  
Dissertation Abstr., B, Sci. Eng. 27, 419 (1966)

"Limitations for and Stereochemistry of Selected Amide-  
Glyoxal Addition Reactions"  
S. L. Vail  
Dissertation Abstr., B, Sci. Eng. 27, 421 (1966)

"Stereochemistry of Pyrrolidine Addition to Bicyclo[2.2.]  
Oct-2-Ene-2-Carbonitrile"  
C. M. Wynn  
Dissertation Abstr., B, Sci. Eng. 27, 424 (1966)

"First Order Electric Quadrupol Splitting of Na<sup>23</sup> Nuclear  
Magnetic Resonance in Ferroelectric Rochelle Salt"  
N. C. Miller  
Dissertation Abstr., B, Sci. Eng. 27, 585 (1966)

"Nuclear Magnetic Resonance in Bismuth Metal"  
B. F. Williams  
Dissertation Abstr., B, Sci. Eng. 27, 589 (1966)

"Chemical Synthesis of Phenoxathin Analogs of Actinomycin"  
W. A. Gay  
Dissertation Abstr., B, Sci. Eng. 27, 751 (1966)

"A. Intramolecular Condensations of Imides. B. Proton  
Magnetic Resonance Spectra of Organophosphorus  
Compounds"  
M. Gordon  
Dissertation Abstr., B, Sci. Eng. 27, 752 (1966)

"Studies of Substituted Cyclopentadienes"  
P. Haynes  
Dissertation Abstr., B, Sci. Eng. 27, 754 (1966)

"Benzoylation of an Enamine"  
J. A. Jung, Jr.  
Dissertation Abstr., B, Sci. Eng. 27, 756 (1966)

"New  $\beta$ -Diketones from Helichrysum Italicum G. Don"  
S. Tira and G. Di Modica, C. Giulio Casinovi, C. Galeffi  
and A. Pela  
Tetrahedron Letters 143 (1967)

"Nachweis von *cis-trans*-Isomeren am Benzol"  
A. Rieker und H. Kessler  
Tetrahedron Letters 153 (1967)

"1,2-Diazetidine: II. Mitteilung: Protonenresonanz-Untersuchungen zur Inversion Am N-1-Atom von Diazetidinonen"  
E. Fahr, W. Fischer, A. Jung und L. Sauer, A. Mannschreck  
Tetrahedron Letters 161 (1967)

"A Novel Reaction of the Ethylenedisulfonyl Group"  
S. J. Daum and R. L. Clarke  
Tetrahedron Letters 165 (1967)

"Synthesis and Rearrangement of Tricyclo[4.3.2.0<sup>1,6</sup>]Undec-10-en-2-one"  
R. L. Cargill and J. W. Crawford  
Tetrahedron Letters 169 (1967)

"Alcaloides Steroidiques LVII. Oxydation d'Imines Steroidiques par Les Peracides: Action de L'Acide Paranitroperbenzoique sur le N-Demethyl Conane-5 $\alpha$ ene-20(N)"  
X. Lusinchi  
Tetrahedron Letters 177 (1967)

"Isolation and Characterisation of Geranylgeraniol"  
B. A. Nagasampagi, L. Yankov and S. Dev  
Tetrahedron Letters 189 (1967)

"Coupling Constants of Fluorinated Cyclic Compounds. Part 1.—1,2,4-Trichloroheptafluorocyclohexene"  
J. Fenney, L. H. Sutcliffe and S. M. Walker  
Trans. Faraday Soc. 62, 2650 (1966)

"Über die Korrelation der NMR-Protonenspektren mit Reaktivitätsindizes einiger pyridinoider Heterocyclen"  
J. Kuthan und V. Skála  
Z. Chem. 6, 422 (1966)

"Zur Amplitude der Kernspinechos in Festkörpern"  
G. Siegle  
Z. Naturforsch., Pt.a, 21, 1722 (1966)

"3. Mitt.: Methylencyclopentene aus 1,3-Dicarbonyl-Verbindungen"  
T. Eicher und A. Löschnar  
Z. Naturforsch., Pt.b, 21, 899 (1966)

"Sterische Hinderung und Isomerisierung der CN-Doppelbindung in Chinonanilen, NMR- und UV-Untersuchungen"  
A. Rieker und H. Kessler  
Z. Naturforsch., Pt.b, 21, 939 (1966)

"Über 5-Hydroxymethyl-cytidin und 5-Hydroxymethyl-cytosin-N-3- $\beta$ -D-glucopyranosid sowie über reaktionsfähige Vorstufen"  
R. Grossmer und E. Rohm  
Z. Naturforsch., Pt.b, 21, 942 (1966)

"Synthese verzweigter Nitro- und Amino-cyclanole"  
F. W. Lichtenhaller, H. Leinert und H. K. Yahya  
Z. Naturforsch., Pt.b, 21, 1004 (1966)

"Über zwei neue Triterpenkarbonsäuren der Ursanreihe mit tetriärer Hydroxylgruppe"  
C. H. Brieskorn und H. Wunderer  
Z. Naturforsch., Pt.b, 21, 1005 (1966)

"Beiträge zur Struktur und Assoziationsbindung des hexameren n-Butyl-lithium"  
I. Craubner  
Z. Physik. Chem. (Frankfurt) 51, 225 (1966)

"Die Protonensignale im kernmagnetischen Resonanzspektrum von Purin bei Anwesenheit von Anilin"  
H. Schmid und P. Kremmayr  
Z. Physik. Chem. (Frankfurt) 51, 297 (1966)

"Magnetic Resonance"  
IN: "Advanced Quantum Chemistry, by H. F. Hameko. Chapter 8.  
Addison-Wesley, Reading, Mass. 1965.

"Theory of Diamagnetic Susceptibilities and Magnetic Shielding Constants for Molecules"  
IN: "Advanced Quantum Chemistry, by H. F. Hameko. Chapter 9.  
Addison-Wesley, Reading, Mass. 1965.

"Analytical Applications of NMR in Petroleum Research"  
N. F. Chamberlain  
Search (Esso Research & Engineering Company) pp. 3, Oct. 1966  
(Condensed from a paper published in Proc. Am. Petroleum Inst. 44 (III), 361 (1965))

"PO-Aktivierte Alkoxyolefinierung"  
W. Grell und H. Machleidt  
Ann. Chem. 699, 53 (1966)

"Abfangen von Sulfenen durch Cycloaddition an vinylogen Carbonsäureamide"  
G. Opitz und E. Tempel  
Ann. Chem. 699, 68 (1966)

"Über die Struktur der acetylierten Cyclohexanon-enamine"  
G. Opitz und E. Tempel  
Ann. Chem. 699, 74 (1966)

"Cyclobutenderivate der Pyrrolreihe"  
A. Treibs und K. Jacob  
Ann. Chem. 699, 153 (1966)

"Kernresonanzspektren einiger Azulenderivate"  
E. Mühlé  
Ann. Phys. 18, 130 (1966)

"Rechenprogramm zur exakten Analyse hochaufgelöster Kernresonanzspektren"  
K. Arnold und G. Tews  
Ann. Phys. 18, 138 (1966)

"Zur Theorie der Momente von magnetischen Kernresonanzen bei rotierenden Proben"  
A. E. Schwind  
Ann. Phys. 18, 159 (1966)

"Der Einfluß der Probenrotation auf die Quadrupolverbreiterung von Kernresonanzen"  
A. E. Schwind  
Ann. Phys. 18, 164 (1966)

"Catalytic Deuterium Exchange Reactions with Organics. XXVII. The Alkylbenzenes on Self-Activated Group VIII Transition Metals"  
B. D. Fisher and J. L. Garnett  
Australian J. Chem. 19, 2299 (1966)

"Cassytha Alkaloids. II. Alkaloids of Cassytha Pubescens R.Br."  
S. R. Johns, J. A. Lamberton, and A. A. Sioumis  
Australian J. Chem. 19, 2331 (1966)

"Cassytha Alkaloids. III. Aporphine Alkaloids from Cassytha Melantha R.Br."  
S. R. Johns, J. A. Lamberton, and A. A. Sioumis  
Australian J. Chem. 19, 2339 (1966)

"Diterpenoids. IX. Agathis Microstachya Oleoresin"  
R. M. Carman and R. A. Marty  
Australia J. Chem. 19, 2403 (1966)

"Zum Einfluß des Stickstoffs auf die chemische Verschiebung von Protonenresonanzen. Die  $^1\text{H}$ -NMR-Spektren von Diphenyl-methyl-s-triazin, 3,6-Diphenyl-tetrazin und 2-Phenylpyridin"  
H. Gunther and S. Castellano  
Ber. Bunsenges. Physik. Chem. 70, 913 (1966)

"Nuclear-Magnetic-Resonance and Mass-Spectral Study of Myxinol Tetra-acetat"  
A. D. Cross  
Biochem. J. 100, 238 (1966)

"Taft Constants of Three-Membered Rings"  
O. A. Yuzhakova, V. F. Bystrov, and R. G. Kostyanovskii  
Bull. Acad. Sci. USSR, Div. Chem. Sci. (English Transl.) 218 (1966)

"Action of Methylamine on N,2-Dimethylmaleimide"  
T. V. Sheremeteva and V. V. Kudryavtsev  
Bull. Acad. Sci. USSR, Div. Chem. Sci. (English Transl.) 259 (1966)

"Synthesis and Pyrolysis of Acetoacetic and (Ethoxycarbonyl) Acetic Esters of  $\alpha$ -Ethyanyl- and  $\alpha$ -Vinyl-3-Cyclohexene-1-Methanols"  
G. P. Kugatova-Shemyakina and D. A. Kazlauskas  
Bull. Acad. Sci. USSR, Div. Chem. Sci. (English Transl.) 262 (1966)

"Configuration and Thermal Isomerization of Adducts of Substituted Cyclopentadienes with Maleic Anhydride"  
V. A. Mironov, T. M. Fadeeva, A. U. Stepanyants, and A. A. Akhrem  
Bull. Acad. Sci. USSR, Div. Chem. Sci. (English Transl.) 293 (1966)

"Some Principles in the Proton Magnetic Resonance Spectra of Heteroorganic Compounds of Group IV"  
A. N. Egorochkin, M. L. Khidkekel', and G. A. Razuvaev  
Bull. Acad. Sci. USSR, Div. Chem. Sci. (English Transl.) 411 (1966)

"Investigation of the Interaction of Trichlorogermaine with Aromatic Compounds and the Noncatalyzed Hydrogermylation of Aromatic Multiple Bonds"  
S. P. Kolesnikov, O. M. Nefedov, and V. I. Sheichenko  
Bull. Acad. Sci. USSR, Div. Chem. Sci. (English Transl.) 417 (1966)

"Nuclear Magnetic Resonance Studies of the Intermolecular Interaction of Amides and Some Other Related Dipolar Molecules"  
T. Yonezawa and I. Morishima  
Bull. Chem. Soc. Japan 39, 2346 (1966)

"An NMR Study of Proton Exchange in Alcohols. I. Oxygen Effects in Methanol"  
S. Fujiwara, Y. Fujiwara and M. Nagai  
Bull. Chem. Soc. Japan 39, 2356 (1966)

"The Oligomerization of Isoprene by Cobalt or Iron Complex Catalysts"  
A. Misono, Y. Uchida, M. Hidai and Y. Ohsawa  
Bull. Chem. Soc. Japan 39, 2425 (1966)

"The Reaction of Optically Active Silver  $\beta$ -Phenylisobutyrate with Halogen"  
S. Oae, T. Kashiwagi and S. Kozuka  
Bull. Chem. Soc. Japan 39, 2441 (1966)

"Copolymerization of Vinyl Chloride and Ethylene Initiated by Trialkylboron-Peroxide Catalyst Systems"  
A. Misono and Y. Uchida  
Bull. Chem. Soc. Japan 39, 2458 (1966)

"Altenin. II. The Structure of Altenin"  
N. Sugiyama, C. Kashima, Y. Hosoi and T. Ikeda, and R. Mohri  
Bull. Chem. Soc. Japan 39, 2470 (1966)

"The Reaction of N-Acylurethans with Phenyl Glycidyl Ether Accompanying Acyl Migration"  
Y. Iwakura, S.-i. Izawa and F. Hayano  
Bull. Chem. Soc. Japan 39, 2485 (1966)

"The Synthesis of an Etiojervane Analog of Progesterone"  
T. Masamune, K. Orito and A. Murai  
Bull. Chem. Soc. Japan 39, 2503 (1966)

"Sesquiterpenes from Dictyopteris Divaricata. II. Dictyopterol and Dictyopterone"  
E. Kuroshima, M. Izawa, K. Yamamoto, T. Masamune and T. Irie  
Bull. Chem. Soc. Japan 39, 2509 (1966)

"The Oxidation of Terpene Compounds with  $t$ -Butyl Chromate. IX. The Oxidation of (+)- $p$ -Menth-1-ene"  
T. Suga, M. Sugimoto, the late K. Fujita, and T. Matsuura  
Bull. Chem. Soc. Japan 39, 2546 (1966)

"Die Kernmagnetischen Resonanz-Spektren Substituierter  
*trans*-Stilbene"

H. Gosten und M. Salzwedel  
Tetrahedron 23, 173 (1967)

"Die Kernmagnetischen Resonanzspektren Substituierter  
*cis*-Stilbene"

H. Gosten und M. Salzwedel  
Tetrahedron 23, 187 (1967)

"Assignment of *cis-trans* Configuration to Constitutionally Symmetrical 2,5-Dialkyl-Tetrahydrofurans"

M. Lj. Mihailovic, R. I. Mamuzic, Lj. Zigic-Mamuzic,  
J. Bosnjak and Z. Cekovic  
Tetrahedron 23, 215 (1967)

"Interaction of Electron Acceptors with Bases—XXI.  
Further Studies of the Proton Magnetic Resonance Spectra of Meisenheimer-Like Compounds"

R. Foster, C. A. Fyfe and (in part) P. H. Emslie and M.  
I. Foreman  
Tetrahedron 23, 227 (1967)

"The Synthesis of Zapotidine"  
R. Mechoulam and A. Hirshfeld  
Tetrahedron 23, 239 (1967)

"Digitanolglykoside—XIV. Partialsynthese von  
Desacylkondurogenin A"  
R. Tschesche, M. Baumgarth und P. Welzel  
Tetrahedron 23, 249 (1967)

"Sesquiterpenes of Neolitsea Zeylanica Merr.—I. Isolation  
of Some Constituents"  
B. S. Joshi, V. N. Kamat and T. R. Govindachari  
Tetrahedron 23, 261 (1967)

"Sesquiterpenes of Neolitsea Zeylanica Merr.—II.  
Structure of Neolinderane"  
B. S. Joshi, V. N. Kamat and T. R. Govindachari  
Tetrahedron 23, 267 (1967)

"Sesquiterpenes of Neolitsea Zeylanica Merr.—III. Structure  
of Zeylanine, Zeylanicine and Zeylanidine"  
B. S. Joshi, V. N. Kamat and T. R. Govindachari  
Tetrahedron 23, 273 (1967)

"The Conformation of A Cycloheptene"  
G. L. Buchanan and J. M. McCrae  
Tetrahedron 23, 279 (1967)

"Proton Magnetic Resonance Studies of Cyclic Compounds—V"  
The Chemical Shifts of the 2,6-Protons in C-Alkyl-

and N-Alkylpiperidines"  
H. Booth and J. H. Little  
Tetrahedron 23, 291 (1967)

"Studies on Bicyclo[3.3.1]Nonanes—I. The Acetolysis  
of 4-Cyclooctenylmethyl Toluene-p-Sulphonate"

K. H. Baggaley, J. R. Dixon, J. M. Evans and S. M. Graham  
Tetrahedron 23, 299 (1967)

"Stereochemical Studies in Flavanoids"

B. J. Bolger, K. G. Marathe, E. M. Philbin and (the late)  
T. S. Wheeler and C. Pl Lillya  
Tetrahedron 23, 341 (1967)

"Sugar Esters—IV. The Preparation of Chloroesters Under  
Essentially-Neutral Conditions"

J. B. Lee and I. M. Downie  
Tetrahedron 23, 359 (1967)

"Corynantheidine-Type Alkaloids—I. Establishment of  
Physical Criteria for the Normal, Pseudo, Allo and  
Epiallo Configurations by Conformational Analysis"  
W. F. Trager, C. M. Lee and A. H. Beckett  
Tetrahedron 23, 365 (1967)

"Corynantheidine-Type Alkaloids—II. Absolute Configura-  
tion of Mitruganine, Speciociliatine, Mitraciliatine  
and Specioganine"  
C. M. Lee, W. F. Trager and A. H. Beckett  
Tetrahedron 23, 375 (1967)

"Cupressuflavone, a New Biflavonyl Pigment"  
V. V. S. Murty, P. V. Raman and T. R. Seshadri  
Tetrahedron 23, 397 (1967)

"The Stereochemistry of Chromomycinone and a Note on  
the Benzoate Rule"

M. Miyamoto, K. Morita, Y. Kawamatsu, K. Kawashima, and  
K. Nakanishi  
Tetrahedron 23, 411 (1967)

"Chromomycin A<sub>2</sub>, A<sub>3</sub> and A<sub>4</sub>"

M. Miyamoto, Y. Kawamatsu, K. Kawashima, M. Shinohara  
K. Tanaka and S. Tatsuoka and K. Nakanishi  
Tetrahedron 23, 421 (1967)

"The Structure of Carotatoxin, A Natural Toxicant from  
Carrot"

D. G. Crosby and N. Aharonson  
Tetrahedron 23, 465 (1967)

"Regulators of Cell Division in Plant Tissues—III. The  
Identity of Zeatin"

D. S. Letham, J. S. Shannon and I. R. C. McDonald  
Tetrahedron 23, 479 (1967)

"Synthesis of Substituted  $\beta$ - and  $\gamma$ -Lactams"

B. G. Chatterjee, V. Venkatesware Rao, S. K. Roy and  
H. P. S. Chawla  
Tetrahedron 23, 493 (1967)

"Some Derivatives of  $\beta$ -Lactams"

B. G. Chatterjee, V. Venkatesware Rao and P. N. Moza  
Tetrahedron 23, 499 (1967)

"Aromatic Polyfluoro-Compounds—XXXV. 1,2,3,4-Tetra-  
fluoroanthraquinone and Some Reactions of Tetrafluoro-  
phthalic Acid Derivatives"

P. L. Coe, B. T. Croll and C. R. Patrick  
Tetrahedron 23, 505 (1967)

"Studies on the Diels-Alder Reaction of Maleic Anhydride  
and  $\beta$ -trans-Ocimene"

K. T. Joseph and G. S. Krishna Rao  
Tetrahedron 23, 519 (1967)

"Evidence of Tautomerism in Imino-Urethanes"

D. M. Colvin and B. C. Uff, and J. W. Lewis  
Tetrahedron Letters 6079 (1966)

"The Photo-Cannizzaro Reaction of Ortho-Phthalaldehyde"  
J. Kagan  
Tetrahedron Letters 6097 (1966)

"Les Transpositions de Cope Enologenes et bis-Enologenes"  
E. Brown, P. Leriverend et J.-M. Conia  
Tetrahedron Letters 6115 (1966)

"A Novel Product from the Reaction of Benzyne with  
Acridine"

B. H. Klanderman  
Tetrahedron Letters 6141 (1966)

"On the Structure of Metaphanine and Its Hofmann  
Degradation Product"

H. L. de Waal and B. J. Prinsloo and R. R. Arndt  
Tetrahedron Letters 6169 (1966)

"Polypropenols of Wood and Leaf Tissue of the Silver Birch,  
*Betula verrucosa*"  
A. R. Wellsburn and F. W. Hemming  
Nature 212, 1364 (1966)

"Nuclear Magnetic Resonance of Fe<sup>57</sup> in Single-Crystal  
Hematite"  
D. H. Anderson  
Phys. Rev. 151, 247 (1966)

"Rearrangement of a Neopentylamine Oxide"  
J. I. Brauman and W. A. Sanderson  
Tetrahedron 23, 37 (1967)

"Structure of the Conjugate Acid of p-Nitroso-N,N-dimethyl-  
aniline"  
D. D. MacNicol, A. L. Porte, and R. Wallace  
Nature 212, 1572 (1966)

"Spin-Echo Decay of Spins Diffusing in a Bounded Region"  
B. Robertson  
Phys. Rev. 151, 273 (1966)

"Photochemical Reaction of Ethyl Azidoformate with Cyclic  
Ethers and Acetals"  
H. Nozaki, S. Fujita, H. Takaya and R. Noyori  
Tetrahedron 23, 45 (1967)

"Terephthalicuredimethylester in den Blättern von Sarothamnus  
scoparius L"  
L. Hörrammer, H. Wagner und D. Krämer-Heydweiller  
Naturwissenschaften 53, 584 (1966)

"Nuclear Magnetic Resonance in the Paramagnetic States  
of MnO, α-MnS, and α-MnSe"  
E. D. Jones  
Phys. Rev. 151, 315 (1966)

"The Nuclear Magnetic Resonance and Mass Spectra of  
Derivatives of Cycloserine"  
G. W. A. Milne and L. A. Cohen  
Tetrahedron 23, 65 (1967)

"Synthese und endgültiger Strukturbeweis von Frangulin  
und Glucofrangulin aus Rhammus frangula L"  
H. Wagner und H. P. Hörrammer  
Naturwissenschaften 53, 585 (1966)

"Pressure Dependence of the Knight Shift in Polycrystalline  
β-Tin, Lead, and Platinum"  
G. A. Matzkanin and T. A. Scott  
Phys. Rev. 151, 360 (1966)

"Tetrahydrocannabinol Analogs. Synthesis of 2-(3-Methyl-  
2-Octyl)-3-Hydroxy-6,6,9-Trimethyl-7,8,9,10-Tetra-  
hydrodibenzo(b,d)Pyran"  
E. C. Taylor, K. Lenard and B. Loev  
Tetrahedron 23, 77 (1967)

"Nuclear Spin-Lattice Relaxation in the Liquid CH<sub>3</sub>COOH-  
CCl<sub>4</sub> System"  
J. E. Anderson  
Nuovo Cimento, Ser. B, 45, 254 (1966)

"Nuclear Spin Relaxation in Solid HD with H<sub>2</sub> Impurity"  
W. N. Hardy and J. R. Gaines  
Phys. Rev. Letters 17, 1278 (1966)

"Dihydroaromatic Compounds in the Diels-Alder Reaction—I"  
A. A. Othman, M. A. Qasseem and N. A. J. Rogers  
Tetrahedron 23, 87 (1967)

"Nuclear Spin-Lattice Relaxation in Indium Metal by NQR"  
D. E. MacLaughlin and J. Butterworth  
Phys. Letters 23, 291 (1966)

"The Effect of Dislocation Dipoles on the Shape of the  
Nuclear Magnetic Resonance Line"  
B. A. Greenberg  
Phys. Stat. Sol. 17, 673 (1966)

"Reactions with Organophosphorus Compounds—III. Reaction  
of Di-, and Trialkyl Phosphites with 1,2,3-Indantrione,  
and 2-Benzylidene-1,3-Indandione"  
A. Mustafa, M. M. Sidky and F. M. Soliman  
Tetrahedron 23, 99 (1967)

"Deuteron Magnetic Resonance Absorption in Polycrystalline  
Heavy Methane Between 1.4 and 73°K"  
P. Pyykko  
Phys. Letters 23, 296 (1966)

"Conductive Polyethylene Resins from Ethylene Copolymers  
and Conductive Carbon Black"  
B. Wartgotz and W. M. Alvino  
Polymer Eng. Sci. 7, 63 (1967)

"Reactions with Organophosphorus Compounds—IV. Reaction  
of Di-, and Trialkyl Phosphites with 1,2-Benzophenazine-  
3,4-Quinone"  
A. Mustafa, M. M. Sidky and F. M. Soliman  
Tetrahedron 23, 107 (1967)

"Nuclear Double Resonance Effects of Multiple Solid Echo  
Trains"  
P. Mansfield and D. Ware  
Phys. Letters 23, 421 (1966)

"Estimation of Aromaticity by NMR Dilution Shifts"  
C. R. Kanekar, G. Govil, C. L. Khetrapal and M. M. Dhingra  
Proc. Indian Acad. Sci. Sect. A 64, 315 (1967)

"Stéroides—CCXVI. Synthèse de Nouveaux Corticoïdes  
Méthylés en Position C-2"  
J. Iriarte, P. Crabbé et A. Bowers  
Tetrahedron 23, 121 (1967)

"Nuclear-Magnetic-Resonance Line Shape in Solids"  
P. Mansfield  
Phys. Rev. 151, 199 (1966)

"The C-D Ring Cleavage of Dihydrocorynantheine Deriva-  
tives. The Partial Synthesis of Dihydroburnamicine"  
L. J. Dolby and S. Sakai  
Tetrahedron 23, 1 (1967)

"Reactions of 5α-Hydroxy Steroids—VII. The Westphalen  
Rearrangement of Some 3β-Substituted-6β-Acetoxy-5α-  
Hydroxy Cholestanes"  
A. Fischer, M. J. Hardman, M. P. Hartshorn, D. N. Kirk,  
and A. R. Thawley  
Tetrahedron 23, 159 (1967)

"Measurement of Nuclear Magnetic Resonance with Quadrupolar  
and Dipolar Broadening in Polycrystalline Samples"  
J. E. Adams, B. F. Williams and R. R. Hewitt  
Phys. Rev. 151, 238 (1966)

"The Constituents of Zaluzania Augusta. The Structures  
of Zaluzanins A and B<sup>11</sup>"  
J. Romo, A. R. De Vivar and P. J. Nathan  
Tetrahedron 23, 29 (1967)

"Verazin, ein Neues Veratrum-Alkaloid Mit 22,26-Imino-  
Cholestan-Cerust"  
G. Adam und K. Schreiber, J. Tomko und A. Vassova  
Tetrahedron 23, 167 (1967)

"Diels-Alder Addition of *o*-Benzoquinones to Cyclopentadiene"  
D. D. Chapman, H. S. Wilgus, III, and J. W. Gates, Jr.  
Tetrahedron Letters 6175 (1966)

"Isolation of New Isoprenyl Alcohols from Silkworm Feces"  
H. Fukawa, M. Toyoda, T. Shimizu, and M. Murohashi  
Tetrahedron Letters 6209 (1966)

"The Photolysis of 2-Phenyl Substituted Quinoline N-Oxides.  
A Tentative Assignment of 4,5-Benz-1,3-Oxazepine Structures to Some of the Products"  
O. Buchardt  
Tetrahedron Letters 6221 (1966)

"Cepharamine" A New Hasubanan Alkaloid from Stephania Cepharantha"  
M. Tomita and M. Kozuka  
Tetrahedron Letters 6229 (1966)

"Coupling and Cyclization of Dihalides Using Nickel Carbonyl: A One-step Synthesis of 1,4,7-Trimethylene-cyclononane from 1,1-Bischloromethylethylene"  
E. J. Corey and M. F. Semmelhack  
Tetrahedron Letters 6237 (1966)

"Reactions of Phenyl Isocyanate with Vinyl Ethers"  
T. Mukaiyama, R. Yoda, and I. Kuwajima  
Tetrahedron Letters 6247 (1966)

"Oxidative Condensation of Catechols and Resorcinols"  
A. C. Waiss, Jr., J. A. Kuhnle, J. J. Windle, and A. K. Wiersema  
Tetrahedron Letters 6251 (1966)

"Alkaloids of Lysichiton Camtschatcense Schott Var., Japonicum Makino"  
N. Katsui and K. Sato, and S. Tobinaga and N. Takeuchi  
Tetrahedron Letters 6257 (1966)

"The Molecular Structure of Ormagine, an Alkaloid of Ormosia Jamaicensis"  
A. P. Davies and C. H. Hassall  
Tetrahedron Letters 6291 (1966)

"Photolysis of Carbon Suboxide in 1,2-Dimethylcyclopropene"  
H. W. Chang, A. Lautzenheiser and A. P. Wolf  
Tetrahedron Letters 6295 (1966)

"A Novel Cleavage Method of Saponin with Soil Bacteria, Intending to the Genuine Sapogenin: On Senega and Panax Saponins"  
I. Yosioka, M. Fujio, M. Osamura, and I. Kitagawa  
Tetrahedron Letters 6303 (1966)

"X-Ray Structure Determination of Yuzurimine Hydrobromide"  
H. Sakurai, N. Sakabe and Y. Hirata  
Tetrahedron Letters 6309 (1966)

"Recherches dans la Serie des Axoles. Protonation et Quaternarisation D'Aryl-1 Pyrazolines"  
P. Bouchet, J. Elguero et R. Jacquier  
Tetrahedron Letters 6409 (1966)

"Thermal Cyclization of a Vinylallene to a Cyclobutene"  
E. Gil-Av and J. Herling  
Tetrahedron Letters 1 (1967)

"Prostaglandins II - An Improved Synthesis and Structural Proof of ( $\dagger$ )-11-Deoxyprostaglandin  $F_{1\beta}$ "  
J. F. Bagli and T. Bogri  
Tetrahedron Letters 5 (1967)

"Pinacol Type Rearrangements in the D Ring of Steroids"  
E. Ghera  
Tetrahedron Letters 17 (1967)

"Final Clarification of the Saturated Hydrocarbons Derived from Hydroxyhopanone, Diploptene, Zeorin, and Dusitanin"  
Y. Tsuda, K. Isobe, S. Fukushima, H. Ageta and K. Iwata  
Tetrahedron Letters 23 (1967)

"The Hydroxymethylene Ketone - Aldo Enol Equilibrium"  
E. W. Garbisch, Jr., and J. G. Russell  
Tetrahedron Letters 29 (1967)

"Optically Active Organotin Compounds I. Preparation and Reaction of (1-Methyl-2,2-Diphenylcyclopropyl) Trimethyltin"  
K. Sisido, S. Kozima and K. Takizawa  
Tetrahedron Letters 33 (1967)

"The Photolysis of  $\beta$ -Ketosulphones: An Intramolecular Rearrangement"  
C. L. McIntosh, P. de Mayo and R. W. Yip  
Tetrahedron Letters 37 (1967)

"Photocycloaddition of Acetylcyanide to Olefins"  
Y. Shigemitsu, Y. Odaira, and S. Tsutsumi  
Tetrahedron Letters 55 (1967)

"The Abnormal Claisen Rearrangement II. High Temperature Chemistry of 1-Ethyl-2-Methylspiro[2,5]Octa-4,6-Diene-8-One"  
E. N. Marvell and B. Schatz  
Tetrahedron Letters 67 (1967)

"Mercury Derivatives of  $\alpha$ -Diazo Ketones"  
P. Yates and F. X. Garneau  
Tetrahedron Letters 71 (1967)

"Zur Struktur von Mecambridin (Oreophilin)"  
S. Pfeifer und I. Mann, L. Dolejs und V. Hanus, A. D. Cross  
Tetrahedron Letters 83 (1967)

"Tautomerism and *syn-anti* Isomerism in the p-Nitrosophenol-p-Benzoylquinone Monoxime System"  
R. K. Norris and S. Sternhell  
Tetrahedron Letters 97 (1967)

"Methyl-Derivate des 4-Thiouridins"  
K. H. Scheit  
Tetrahedron Letters 113 (1967)

"31-Norcycloartanol and Cycloartanol from Polypodium Vulgare"  
G. Berti, F. Bottari, A. Marsili, I. Morelli and M. Polvani and A. Mandelbaum  
Tetrahedron Letters 125 (1967)

"The Reaction of Ethoxide with 1,2,3,3-Tetrahalocyclobutenes: Electronic Control of Nucleophilic Attack"  
J. D. Park, G. Groppelli and J. H. Adams  
Tetrahedron Letters 103 (1967)

"Dimethyloxosulphonium Methylide: A Tool for the Synthesis of Five-Membered Heterocycles"  
G. Gaudiano, A. Umani-Ronchi, P. Bravo and M. Acampora  
Tetrahedron Letters 107 (1967)

"1,2-Dibromopyracylene: A New Aromatic System:  
B. M. Trost and D. R. Brittelli  
Tetrahedron Letters 119 (1967)

"Nuclear Magnetic Resonance Spectra and Structure of Some Trimethylplatinum(IV) Compounds"  
K. Kite, J. A. S. Smith, and E. J. Wilkins  
J. Chem. Soc., A, Inorg. Phys. Theor. 1744 (1966)

"Nuclear Magnetic Resonance Spectra of Some  $\beta$ -Diketone Complexes of Group III and IV Elements"  
J. A. S. Smith and E. J. Wilkins  
J. Chem. Soc., A, Inorg. Phys. Theor. 1749 (1966)

"Organophosphorus Chemistry. Part VIII. Four-membered Phosphorus-Nitrogen Ring Compounds"  
M. Green, R. N. Haszeldine, and G. S. A. Hopkins  
J. Chem. Soc., A, Inorg. Phys. Theor. 1766 (1966)

"Nuclear Magnetic Resonance Studies on Metal Complexes. Part III. Dimethylphenylphosphine Complexes of Ruthenium(II)"  
J. M. Jenkins, M. S. Lupin, and B. L. Shaw  
J. Chem. Soc., A, Inorg. Phys. Theor. 1787 (1966)

"Nuclear Magnetic Resonance Studies on Metal Complexes. Part IV. Arylnickel(II)-Dimethylphenylphosphine Complexes"  
J. R. Moss and B. L. Shaw  
J. Chem. Soc., A, Inorg. Phys. Theor. 1793 (1966)

"Chemistry of the Metal Carbonyls. Part XXXVIII. Reactions of Dicarbonyl- $\gamma$ -cyclopentadienylferrate(—II) with Polyfluoroaromatic Compounds"  
M. I. Bruce and F. G. A. S one  
J. Chem. Soc., A, Inorg. Phys. Theor. 1837 (1966)

"Determination of the Relative Signs of the  $^{14}\text{N}-\text{H}$  Spin Coupling Constants in Ethyl Isonitrile by Nuclear Magnetic Resonance Double Irradiation"  
J. P. Maher  
J. Chem. Soc., A, Inorg. Phys. Theor. 1855 (1966)

"The Proton Magnetic Resonance Spectra of Pyridine 1-Oxides and their Conjugate Acids"  
R. A. Abramovitch and J. B. Davis  
J. Chem. Soc. Sect. B, Phys. Org. 1137 (1966)

"Maleic Anhydride-Hexamethylbenzene Mixtures in Methyl-cyclohexane Solution and in the Solid State. Part II. Photochemical and Thermal Reactions"  
Z. Raciszewski  
J. Chem. Soc. Sect. B, Phys. Org. 1147 (1966)

"Proton Magnetic Resonance Spectra of Some 1-Amino-3,3-diphenyl-propanes and Related Compounds"  
A. F. Casey  
J. Chem. Soc. Sect. B, Phys. Org. 1157 (1966)

"Studies on Phenylphosphorus Dihalides"  
A. Finch, P. J. Gardner, and K. K. Sen Gupta  
J. Chem. Soc. Sect. B, Phys. Org. 1162 (1966)

"Mechanism of Deitration of Nitroguanidines in Concentrated Acids. Some New Evidence"  
J. C. Lockhart  
J. Chem. Soc. Sect. B, Phys. Org. 1174 (1966)

"Quantitative Aspects of Radical Addition. Part IV. Rate-constant Ratios for Addition of Trichloromethyl and Thiyl Radicals to Olefins"  
J. I. G. Cadogan and I. H. Sadler  
J. Chem. Soc. Sect. B, Phys. Org. 1191 (1966)

"Elimination-Addition. Part VIII. Structures of Acetylene-Amine Adducts"  
C. H. McMullen and C. J. M. Stirling  
J. Chem. Soc. Sect. B, Phys. Org. 1217 (1966)

"Elimination-Addition. Part IX. Reactions of p-Toluoyl-acetylene and p-Toluoylacetaldehyde with  $\alpha$ -Phenylethylamine"  
C. H. McMullen and C. J. M. Stirling  
J. Chem. Soc. Sect. B., Phys. Org. 1221 (1966)

"The Reduction of 3',6'-Dihydroxy-1,2-benzocycloheptene-3,7-dione"  
N. M. D. Brown, A. M. Khan, and G. R. Proctor  
J. Chem. Soc., C, Organic 1889 (1966)

"Aspects of Catalytic Hydrogenation with a Soluble Catalyst"  
A. J. Birch and K. A. M. Walker  
J. Chem. Soc., C, Organic 1894 (1966)

"Structure and Biological Activity of Steroids. Part I. The Hydrogenbonding Properties of Halogenohydrins in the  $t$ -Butylcyclohexane and Steroid Series"  
A. B. Devine and R. E. Lack  
J. Chem. Soc., C, Organic 1902 (1966)

"Studies of Heterocyclic Compounds. Part IV. Electrophilic Substitution of 6-Methylpyrrolo[2,1-b]thiazole"  
S. McKenzie, B. B. Molloy and D. H. Reid  
J. Chem. Soc., C, Organic 1908 (1966)

"The Structure and Chemistry of Leucodrin"  
G. W. Perold and K. G. R. Pachler  
J. Chem. Soc., C, Organic 1918 (1966)

" $\beta$ -Aryl- $\alpha$ -oxoglutaric Acids"  
G. W. Perold and H. K. L. Hundt  
J. Chem. Soc., C, Prorganic 1924 (1966)

"Taxine. Part II. A Revised Structure for the Neutral Fragment from O-Cinnamoyltaxicin-1"  
J. W. Harrison and B. Lythgoe  
J. Chem. Soc., C, Organic 1932 (1966)

"Taxine. Part IV. The Constitution of Taxine-1"  
J. W. Harrison, R. M. Scrowston and B. Lythgoe  
J. Chem. Soc., C, Organic 1933 (1966)

"The Preparation and Properties of Some Derivatives of N-Methylazepine"  
R. F. Childs and A. W. Johnson  
J. Chem. Soc., C, Organic 1950 (1966)

"Some Alkylations of 2-Methylcyclopentane-1,3-dione"  
D. Rosenthal and K. H. Davis, Jr.  
J. Chem. Soc., C, Organic 1973 (1966)

"Syntheses of Heterocyclic Compounds. Part XIV. Oxazoles from the Pyrolysis of Aryl Azides in a Mixture of a Carboxylic and Polyphosphoric Acid"  
R. Garner, E. B. Mullock and H. Suschitzky  
J. Chem. Soc., C, Organic 1980 (1966)

"Studies on the Possible Interconversion of Phenylhydrazones and Phenylazoalkanes. Part III. Adipaldehyde Bisphenylhydrazone"  
A. J. Bellamy, R. D. Guthrie, and (in part) G. J. F. Chittenden  
J. Chem. Soc., C, Organic 1989 (1966)

"Fluorocarbohydrates. Part XIV. Reaction of N-(2-Chloro-1,1,2-trifluoroethyl)diethylamine with Some  $\alpha$ -Isopropylidene Sugars"  
K. R. Wood, D. Fisher, and P. W. Kent  
J. Chem. Soc., C, Organic 1994 (1966)

"Clemmensen Reduction. Part III.  $\alpha\beta$ -Unsaturated Ketones"  
B. R. Davis and P. D. Woodgate  
J. Chem. Soc., C, Organic 2006 (1966)

"Some Reactions of Dieldrin and the Proton Magnetic Resonance Spectra of the Products"  
A. M. Parsons and D. J. Moore  
J. Chem. Soc., C, Organic 2026 (1966)

"Chelation and Isomerism in Organotin Oxinates"  
W. Kitching  
*J. Organometal. Chem.* 6, 586 (1966)

"Nuclear Magnetic Resonance Dilution Shifts for Carboxylic Acids in Rigorously Dried Solvents. II. Benzoic Acid in Benzene"  
N. Muller and O. R. Hughes  
*J. Phys. Chem.* 70, 3975 (1966)

"Anionic Telomerizations of Butadiene with Aromatic Hydrocarbons. III. Chemical Structure of Telomer"  
S. Kume, H. Saka, A. Takahashi, G. Nishikawa, M. Hatano, and S. Kambara  
*Makromol. Chem.* 98, 109 (1966)

"Vicinal  $^1\text{H}$ - $^{199}\text{Hg}$  Coupling Constants"  
M. M. Kreevoy and J. F. Schaefer  
*J. Organometal. Chem.* 6, 589 (1966)

"Intramolecular Interaction Involving Group IV Elements. Spectral Properties of I-(Trimethylsilyl)-2-Propanone"  
W. K. Musker and G. L. Larson  
*J. Organometal. Chem.* 6, 627 (1966)

" $^1\text{H-NMR}$ -Messungen an Substituierten Ferricinium-Kationen"  
H. P. Fritz, H. J. Keller und K. E. Schwarzhans  
*J. Organometal. Chem.* 6, 652 (1966)

"NMR Kinetic Studies of the Reactions Occurring in the System  $\text{C}_6\text{H}_7\text{OPdCl}_2\text{Ph}_3\text{As}$ "  
K. Vrieze, P. Cossee, C. MacLean and C.W. Hilbers  
*J. Organometal. Chem.* 6, 672 (1966)

"The Nuclear Magnetic Resonance Spectra of Some 1,4-Disubstituted Naphthalenes"  
W. B. Smith and S. Chiranjeevi  
*J. Phys. Chem.* 70, 3505 (1966)

"Dielectric Relaxation, Nuclear Magnetic Resonance, Infrared Absorption, and Hydrogen Bonding in Benzene Solutions of Phenols and Anilines"  
F. K. Fong, J. P. McTague, S. K. Garg, and C. P. Smyth  
*J. Phys. Chem.* 70, 3567 (1966)

"Nuclear Magnetic Resonance of Hydrogen Polysulfides in Molten Sulfur"  
J. B. Hyne, E. Muller and T. K. Wiewiorowski  
*J. Phys. Chem.* 70, 3733 (1966)

"Spin-Spin Coupling in Di-t-butyl Carbinol"  
L. K. Patterson and R. M. Hammaker  
*J. Phys. Chem.* 70, 3745 (1966)

"Solvent Effects on  $^{13}\text{C-H}$  Coupling Parameters and Chemical Shifts of Some Halomethanes"  
V. S. Watts and J. H. Goldstein  
*J. Phys. Chem.* 70, 3887 (1966)

"Solvent Effects in the Proton Chemical Shifts of Acetonitrile and Malononitrile"  
T. Matsuo and Y. Kodera  
*J. Phys. Chem.* 70, 4087 (1966)

"Information on Polymerization Mechanism and NMR Spectroscopy of High Polymers"  
R. Chujo  
*J. Phys. Soc. Japan* 21, 2669 (1966)

"La<sup>199</sup> and Mn<sup>55</sup> NMR Signals from Ferromagnetic (La<sub>1-x</sub>Sr<sub>x</sub>) MnO<sub>3</sub>"  
Gen. Matsumoto and S. Iida  
*J. Phys. Soc. Japan* 21, 2734 (1966)

"Deuteron Magnetic Resonance in Polycrystalline ND<sub>4</sub>NO<sub>3</sub> between 100 and 403°K"  
V. Hovi, U. Jarvinen, and P. Pyykko  
*J. Phys. Soc. Japan* 21, 2742 (1966)

"Impurity Nucleus Relaxation in Ferromagnetic Metals"  
M. B. Salomon  
*J. Phys. Soc. Japan* 21, 2746 (1966)

"Helmholtz-type Coils of Finite Cross Section"  
E. R. Andrew, I. Roberts and R.C. Gupta  
*J. Sci. Instru.* 43, 936 (1966)

"NMR Study on Oriented Polyethyleneterephthalate Films"  
L. G. Kazaryan and Ya. G. Urman  
*J. Struct. Chem. USSR (English Transl.)* 7, 47 (1966)

"Nuclear Magnetic Resonance of Ammonia Protons Adsorbed on Various Type A Zeolite Cation Exchangers"  
A. M. Eremenko, M. A. Piontovskaya, I. V. Matyash, V. V. Mank, M.G. Starkov, and I. E. Neimark  
*J. Struct. Chem. USSR (English Transl.)* 7, 95 (1966)

"The Constitution of Styrene-Polysulfone"  
M. Iino, A. Hara and N. Tokura  
*Makromol. Chem.* 98, 81 (1966)

"Studies on the Structure of Polyurethane Elastomers. II. High Resolution NMR Spectroscopic Determination of Allophanate and Biuret Linkages in the Cured Polyurethane Elastomer: Degradation by Amine"  
H. Okuto  
*Makromol. Chem.* 98, 148 (1966)

"A Chemical Means of Distinguishing Between Conjugated —(C=C)<sub>x</sub> and Conjugated —(C=N)<sub>x</sub> Bonds"  
L. H. Peebles, Jr. and J. Brandrup  
*Makromol. Chem.* 98, 189 (1966)

"Nuclear Magnetic Resonance Studies of Alkali Metal Halide Solutions. I. Cation Resonances"  
C. Devereall and R.E. Richards  
*Mol. Phys.* 10, 551 (1966)

"N.M.R. Studies of Isotopically Substituted Molecules: The Sign of the C≡N Coupling Constant"  
W. McFarlane  
*Mol. Phys.* 10, 603 (1966)

"Synthese und Hydrolyse von 1,3-Dihydro-1,3,2-benzodiazaphosphol-2-oxiden"  
E. Steininger und H. Deibig  
*Monatsh. Chem.* 97, 1326 (1966)

"Über die NMR-Spektren von Sulfoniumyliden"  
A. Hochrainer und W. Silhan  
*Monatsh. Chem.* 97, 1477 (1966)

"Über Ketenacylate des 1,2,3,4-Tetrahydronaphthalindicarbonsäure-(1,8)-anhydrids"  
R. Kuhn, I. Butula und W. Otting  
*Monatsh. Chem.* 97, 1533 (1966)

"Immunochemically Significant Fluorescins: Structure Determination by Nuclear Magnetic Resonance Spectroscopy"  
H. S. Corey, Jun. and F. C. Churchill, II  
*Nature* 212, 1040 (1966)

"Deuteron Quadrupole Coupling and Hydrogen Bonding in Crystals"  
R. Blinc and D. Hadzi  
*Nature* 212, 1307 (1966)

"*s*-Triazolopyrazines"  
S. E. Mallett and F. L. Rose  
J. Chem. Soc., C, Organic 2038 (1966)

"The Reaction of Benzene with Aluminium Chloride"  
G. E. Hall and E. A. Johnson  
J. Chem. Soc., C, Organic 2043 (1966)

"Polyhalogenoallenes. Part IV. Thermal Co-dimerisation of Tetrafluoroallene with Hexafluorobut-2-yne"  
R. E. Banks, W. R. Deem, R. N. Haszeldine, and D. R. Taylor  
J. Chem. Soc., C, Organic 2051 (1966)

"A Vitamin-A Aldehyde-Tricarbonyliron Adduct"  
A. J. Birch and H. Fitton  
J. Chem. Soc., C, Organic 2060 (1966)

"Phenol Oxidation. Part I. The Synthesis of Isoboldine and Glaucine"  
A. H. Jackson and J. A. Martin  
J. Chem. Soc., C, Organic 2061 (1966)

"Benzoyloxyacetonitrile and Methyl Benzoyloxyacetimidate"  
R. B. LaCount and C. E. Griffin  
J. Chem. Soc., C, Organic 2071 (1966)

"Photochemical Transformations of Tropolones. Part II. 4<sup>1</sup>,5<sup>1</sup>-Dimethoxy-6,7-benztropolone Methyl Ether and its Photo-oxidation"  
E. J. Forbes and J. Griffiths  
J. Chem. Soc., C, Organic 2072 (1966)

"Cyclisation and C-Acylation of 2,6-Dioxocyclohexylacetic Acids"  
B. M. Goldschmidt, B. L. Van Duuren, and C. Mercado  
J. Chem. Soc., C, Organic 2100 (1966)

"Polyfluorocyclopentadienes. Part II. The Thermal Dimer of Perfluorocyclopentadiene: Perfluoro(tricyclo [5,2,1,0<sup>2,6</sup>]deca-3,8-diene)"  
R. E. Banks, A. C. Harrison and R. N. Haszeldine  
J. Chem. Soc., C, Organic 2102 (1966)

"Studies Relating to Phthiocerol. Part V. Phthiocerol A and B"  
D. E. Minnikin and N. Polgar  
J. Chem. Soc., C, Organic 2107 (1966)

"Studies Relating to Phthiocerol. Part VI. Stereochemical Studies"  
K. Maskens, D. E. Minnikin, and N. Polgar  
J. Chem. Soc., C, Organic 2113 (1966)

"Peptides. Part XXIII. Experiments on the Oxidation of Thiotrepton"  
M. A. Barton, G. W. Kenner, and R. C. Sheppard  
J. Chem. Soc., C, Organic 2115 (1966)

"Preparation of Indolizines from Ethyl Bromopyruvate and Ethyl 2-Pyridylacetate"  
D. R. Bragg and D. G. Wibberley  
J. Chem. Soc., C, Organic 2120 (1966)

"West African Timbers. Part XVIII. Some Reactions of Cedrela odorata substance "B" and Khayasin"  
E. K. Adesogan, C. W. L. Bevan, J. W. Powell, and D. A. H. Taylor  
J. Chem. Soc., C, Organic 2127 (1966)

"The Reductive Alkylation of Isoquinoline"  
P. Garside and A. C. Ritchie  
J. Chem. Soc., C, Organic 2140 (1966)

"Preparation of Chlorofluorobenzenes and Chlorofluoropyridines by Halogen Exchange with Fused Salts"  
H. C. Fielding, L. P. Gallimore, H. L. Roberts and B. Title  
J. Chem. Soc., C, Organic 2142 (1966)

"Carotenoids and Related Compounds. Part XIV. Stereochemistry and Synthesis of Geraniol, Nerol, Farnesol, and Phytol"  
J. W. K. Burrell, R. F. Garwood, L. M. Jackman, E. Oskay, and B. C. L. Weedon  
J. Chem. Soc., C, Organic 2144 (1966)

"Carotenoids and Related Compounds. Part XV. The Structure and Synthesis of Pytoene, Phytofluene,  $\gamma$ -Carotene, and Neurosporene"  
J. B. Davis, L. M. Jackman, P. T. Siddons, and B. C. L. Weedon  
J. Chem. Soc., C, Organic 2154 (1966)

"Carotenoids and Related Compounds. Part XVI. Structural and Synthetic Studies on Spirilloxanthin, Chloroxanthin, Spheroidene, and Spheroxydene"  
M. S. Barber, L. M. Jackman, P. S. Manchard and B. C. L. Weedon  
J. Chem. Soc., C, Organic 2166 (1966)

"Organophosphorus Intermediates. Part I. The Formation and Decomposition of Phenylphosphinic Anhydride"  
M. J. Gallagher and I. D. Jenkins  
J. Chem. Soc., C, Organic 2176 (1966)

"Quinones. Part VII. New Routes to 2-Hydroxy-1,4-naphthaquinones"  
A. C. Baillie and R. H. Thomson  
J. Chem. Soc., C, Organic 2184 (1966)

"Extractives from Guttiferae. Part III. The Isolation and Structure of Symphonanthone and Globuxanthone from Symphonia globulifera L."  
H. D. Locksley, I. Moore, and F. Scheinmann  
J. Chem. Soc., C, Organic 2186 (1966)

"Preparation and Properties of Some Substituted Quinalino[3,2-b]-cinnolines"  
M. J. Kort and M. Lamchen  
J. Chem. Soc., C, Organic 2190 (1966)

"Compounds Related to the Steroid Hormones. Part XVIII. An Improved Method of Preparation of 21-Acetoxy-17-hydroxy-16 $\beta$ -methyl-5 $\alpha$ -pregn-9-ene-3,20-dione"  
G. I. Gregory, J. S. Hunt, P. J. May, (Mrs.) F. A. Nice, and G. H. Phillips  
J. Chem. Soc., C, Organic 2201 (1966)

"Compounds Related to the Steroid Hormones. Part XVIII. Reaction of 16 $\alpha$ , 17 $\alpha$ -Epoxy-16 $\beta$ -methyl-5 $\alpha$ -pregnan-20-ones with Boron Trifluoride"  
P. J. May, (Mrs.) F. A. Nice, and G. H. Phillips  
J. Chem. Soc., C, Organic 2210 (1966)

"Addition Reactions of Heterocyclic Compounds. Part XXV. Dimethyl Acetylenedicarboxylate with Pyridazines and Pyrazines"  
R. M. Acheson and M. W. Foxton  
J. Chem. Soc., C, Organic 2218 (1966)

"Phenol Oxidation. Part II. Synthesis of Orientalinone, Corydine, and Isocorydine"  
A. H. Jackson and J. A. Martin  
J. Chem. Soc., C, Organic 2222 (1966)

"Furfurylidene Derivatives of Glucitol"  
T. G. Bonner, E. J. Bourne, Miss S. E. Harwood, and D. Lewis  
J. Chem. Soc., C, Organic 2229 (1966)

"Studies in Mycological Chemistry. Part XXI. The Structure of Aurofusarin, a Metabolite of Some Fusarium Species"  
P. M. Baker and J. C. Roberts  
J. Chem. Soc., C, Organic 2234 (1966)

"The Chemistry of Fungi. Part LVI. Aurofusarin"  
G. R. Birchall, K. Bowden, U. Weiss, and W. B. Whalley  
J. Chem. Soc., C, Organic 2237 (1966)

"Organometallic Chemistry of the Transition Metals. XVI. Polynuclear Cyclopentadienylmetal Carbonyls of Iron and Cobalt"  
R. B. King  
Inorg. Chem. 5, 2227 (1966)

"Reactions of Phosphonitrilic Chloride with p-Nitrophenol"  
E. Kober, H. Lederle, and G. Ottmann  
Inorg. Chem. 5, 2239 (1966)

"Fluorine-19 Nuclear Magnetic Resonance Study of Mixed Adducts of Titanium Tetrafluoride"  
D. S. Dyer and R. O. Ragsdale  
Inorg. Chem. 6, 8 (1967)

" $\pi$ -Coordination of Unsaturated Bonds Containing Heteroatoms. II. Iron Carbonyl Complexes of Azomethine Analogs of 1,3-Dienes. Preparation and Nature of the Coordination Bondings"  
S. Otsuka, T. Yoshida and A. Nakamura  
Inorg. Chem. 6, 20 (1967)

"Reactions of Alkali Metal Derivatives of Metal Carbonyls. VIII. Preparation, Protonation, and Alkylation of Sodium Cyanopentacarbonylmetalates"  
R. B. King  
Inorg. Chem. 6, 25 (1967)

"Organometallic Chemistry of the Transition Metals. XVIII. Some New Cyclopentadienylmetal Nitrosyl Derivatives of Manganese and Molybdenum"  
R. B. King  
Inorg. Chem. 6, 30 (1967)

"1,1,1,5,5-Hexafluoropentane-2,4-dionato Complexes of Magnesium(I) Containing Various Monodentate Ligands"  
F. A. Hartman, M. Kelner and A. Wojcicki  
Inorg. Chem. 6, 34 (1967)

"A Proton Magnetic Resonance Study of Some Alkylalkoxy-silanes"  
T. Ostwick and P. A. McCusker  
Inorg. Chem. 6, 98 (1967)

"Transmission of Substituent Effects Through the Nitrogen-Silicon-Nitrogen System"  
C. H. Yoder and J. J. Zuckerman  
Inorg. Chem. 6, 103 (1967)

"On the Question of Autoionization in Complexes of Metal Pentafluorides"  
F. N. Tebbe and E. L. Muetterties  
Inorg. Chem. 6, 129 (1967)

"A Broad-Line Proton Magnetic Resonance Study of Cobalt Tetracarbonyl Hydride"  
T. C. Farrar, F. E. Brinckman, T. D. Coyle, A. Davison, and J. W. Faller  
Inorg. Chem. 6, 161 (1967)

"Proton Magnetic Resonance Studies of Pyridine Complexes of Bis(benzoylacetonato)nickel(II) and -cobalt(II)"  
R. J. Kluiber and W. DeW. Horrocks, Jr.  
Inorg. Chem. 6, 166 (1967)

"Polycyclic Group V Ligands. III. 2,6,7-Trimethyl-4-methyl-2,6,7-triaza-1-phosphabicyclo[2.2.2]octane. A Bidentate Donor"  
B. J. Laube, R. D. Bertrand, G. A. Casedy, R. D. Compton and J. G. Verkade  
Inorg. Chem. 6, 173 (1967)

"The Reaction of Tetrafluorohydrazine with Arsenic Pentafluoride. Evidence for the Existence of  $N_2F_5^+$  Salts"  
A. R. Young, II, and D. Moy  
Inorg. Chem. 6, 178 (1967)

"Stereochemically Nonrigid Organometallic Compounds. IV. Some Observations on -Allylic Complexes"  
F. A. Cotton, J. W. Faller, and A. Musco  
Inorg. Chem. 6, 179 (1967)

"Stereochemically Nonrigid Organometallic Compounds. V. Configurational Equilibria in Bis(acetylacetonato)tin Complexes"  
J. W. Faller and A. Davison  
Inorg. Chem. 6, 182 (1967)

"The Conformations of *cis* and *trans* 2-Cyclopropyl-pent-2-ene"  
J. Yovell  
Israel J. Chem. 4, 20p (1966)

"The Complete Structure of Melianone"  
M. K. Jain, I. Kirson and D. Lavie  
Israel J. Chem. 4, 32p (1966)

"Studies of the Reversible Hydration of Aliphatic Carbonyl Compounds by  $^{17}\text{O}$  and  $^1\text{H}$  Nuclear Magnetic Resonance"  
P. Greenzaid, Z. Luz and D. Samuel  
Israel J. Chem. 4, 51p (1966)

"An Oxygen-17 NMR Study of the Pentaquovanadyl (IV) Ion"  
J. Reuben and D. Fiat  
Israel J. Chem. 4, 53p (1966)

"Oxygen-17 NMR Studies of the Hydration and Complexation of the Dysprosium (III) Ion in Solution"  
J. Reuben and D. Fiat  
Israel J. Chem. 4, 54p (1966)

"Isotopic Solvent Effects in NMR"  
M. Shporer and A. Loewenstein  
Israel J. Chem. 4, 55p (1966)

"Infrared Spectra and Configurations of Alkylthiourea Derivatives. Normal Vibrations of  $N,N'$ -Dimethyl- and Tetramethylthiourea"  
R. K. Gosavi, U. Agarwala, and C. N. R. Rao  
J. Am. Chem. Soc. 89, 235 (1967)

"A Study of the  $\text{HF}_2^-$  Ion by Fluorine Magnetic Resonance"  
R. Haque and L. W. Reeves  
J. Am. Chem. Soc. 89, 250 (1967)

"The Formation of Carbon to Metal  $\sigma$ -Complexes between Palladium(II) Chloride and Allylic Amines"  
A. C. Cope, J. M. Kliegman, and E. C. Friedrich  
J. Am. Chem. Soc. 89, 287 (1967)

"Transfer Reactions Involving Boron. XI. The Reaction of Monochloro- and Dichloroborane with Olefins"  
D. J. Pasto and P. Balasubramanyan  
J. Am. Chem. Soc. 89, 295 (1967)

"Bimolecular Eliminations in Conformationally Biased Systems Containing Acidic  $\beta$  Protons. The 2-( $\rho$ -Tolylsulf-4- $\beta$ -butylcyclohexyl Sulfonates"  
W. M. Jones, T. G. Squires, and Merrill Lynn  
J. Am. Chem. Soc. 89, 318 (1967)

"Hindered Rotation in 1-Benzyl-1,2,3,4-tetrahydro-6,7-dimethoxyisoquinolines"  
G. Fraenkel, M. P. Cava, D. R. Dalton  
J. Am. Chem. Soc. 89, 329 (1967)

"Quinazolines and 1, 4-Benzodiazepines. XXXIII. Three Tautomeric Forms of the Benzodiazepine Ring System"  
G. F. Field, W. J. Zally and L. H. Sternbach  
J. Am. Chem. Soc. 89, 332 (1967)

"Alkyl Migration to Electron-Deficient Nitrogen"  
P. G. Gassman and B. L. Fox  
J. Am. Chem. Soc. 89, 338 (1967)

"A New Aromatic Glycoside from *Zea mays*"  
H. E. Gahagan and R. O. Mumma  
Chem. Ind. (London) 1967 (1966)

"Eremophilone and Alloeremophilone from Hydroxydihydro-  
eremophilone"  
R. B. Bates and S. K. Paknikar  
Chem. Ind. (London) 2170 (1966)

"Structure of a Diacetyl Nitro Cyclopentadiene"  
A. N. Campbell-Crawford, A. M. Gorringe & D. Lloyd  
Chem. Ind. (London) 1961 (1966)

"An All-Plastic Evacuable Cell for Solution Spectroscopy"  
M. F. A. Dove and J. G. Hallett  
Chem. Ind. (London) 2051 (1966)

"Cyclisation of 4,4-Dichloro-2-morpholino-but-3-en-1-ol:  
2-Chloro-4-morpholino-4,5-dihydrofuran"  
R. Dowbenko  
Chem. Ind. (London) 2097 (1966)

"N.M.R. Spectrum of a Dianion in Liquid Ammonia"  
M. L. Miles and C. G. Moreland, D. M. von Schriltz, C. R. Hause  
Chem. Ind. (London) 2098 (1966)

"Synthesis of Hydroxypiperidines from Carbohydrate  
Precursors"  
S. Hanessian  
Chem. Ind. (London) 2126 (1966)

"Electrolytic and Photochemical Oxidation of Corypalline"  
J. M. Bobbit, J. T. Stock, A. Marchand and K. H. Weisgraber  
Chem. Ind. (London) 2127 (1966)

"Selective Carboalkoxylation of 6-Methoxy-2-tetralone"  
E. W. Colvin, J. Martin and B. Shroot  
Chem. Ind. (London) 2130 (1966)

"Nuclear Magnetic Resonance Spectra of Long-chain 1,2-  
Disubstituted Cyclopropane Esters"  
D. E. Minnikin  
Chem. Ind. (London) 2167 (1966)

"Oxidation of n-Alkyl Chains by Chromium Trioxide"  
I. T. Harrison and S. Harrison  
Chem. Ind. (London) 2168 (1966)

"Studies on the Diazo- $\beta$ -Azomethine- $\gamma$ -Triazine Equilibrium"  
C. Temple, Jr., C. L. Kussner, and J. A. Montgomery  
Chem. Ind. (London) 2197 (1966)

"Structure of Theasapogenol E"  
I. Yosioka, A. Matsuda, T. Nishimura and I. Kitagawa  
Chem. Ind. (London) 2202 (1966)

"Reazioni dell'allilsolfocloruro con le enammine"  
S. Maiorana, G. Pagani  
Chim. Ind. (Milan) 48, 1193 (1966)

"Reazioni di ciclizzazione di  $\beta$ -allilsolfonilenammine"  
S. Maiorana  
Chim. Ind. (Milan) 48, 1195 (1966)

"Isolation and chemistry of the Alkaloids from Some Plants  
of the Genus *Papaver*. XXXV. The Structure of the  
Alkaloids Amurensine and Amurensinine"  
F. Santavy, L. Hruban and M. Maturova  
Collection Czech. Chem. Commun. 31, 4286 (1966)

"New Synthesis of ( $\pm$ )-2,8-Dimethyl-2-Ethyl-1,2,3,4-  
Tetrahydrophenanthrene, the Dehydrogenation Product  
of Some Diterpenoids"  
J. Kuthan, A. Kozlik and F. Petru  
Collection Czech. Chem. Commun. 31, 4425 (1966)

"Non-équivalence magnétique dans les fluoroalcools (1)  
fluoro-2 phényl-2 éthanol et fluoro-2 phényl-1 éthanol"  
J.-A. Martin et M.-J. Huron  
Comptes Rend. Ser. B, 263, 1073 (1966)

"Effet de solvant sur le déplacement chimique du proton, en  
résonance magnétique nucléaire, de quelques gaz simples  
dissous"  
E. Dayan et G. Widénlocher  
Compt. Rend. Ser. B, 263, 1346 (1966)

"Synthèse totale de la scutellareïne par un nouveau  
procédé de condensation thermique"  
M. Jouanne et C. Mentzer  
Compt. Rend. Ser. C, 263, 1022 (1966)

"Sur la synthèse de dihydro-2,3pyrone-4."  
S. Gelin et R. Gelin  
Compt. Rend. Ser. C, 263, 1029 (1966)

"Synthèse de pyrazines et dihydropyrazines."  
N. Vinot et J. Pinson  
Compt. Rend. Ser. C, 263, 1156 (1966)

"Réduction-alcoylation des cétoximes à caractère  
aromatique"  
J.-A. Gauthier, M. Miocque, C. Fauran et A.-Y. Le Cloarec  
Compt. Rend. Ser. C, 263, 1164 (1966)

"Effet des substituants sur la photooxydation des systèmes  
aromatiques. Premier exemple d'isolement d'un  
photooxyde en série naphtalénique; sa dissociation  
thermique"  
J. Rigaudy, C. Delétang et J.-J. Basselier  
Compt. Rend. Ser. C, 263, 1435 (1966)

"Synthèse et spectre de résonance magnétique nucléaire de  
la quino [5,6-f] quinoléine"  
N. P. Buu-Hoi, M. Dufour et P. Jacquignon  
Compt. Rend. Ser. C, 263, 1448 (1966)

"Etude du composé obtenu par action de l'acétylène sur  
l'anthracène"  
J.-C. Muller et J. Vergne  
Compt. Rend. Ser. C, 263, 1452 (1966)

"Recherches dans la série des azoles. Bromation des  
acides de des esters pyrazolecarboxyliques"  
J. Elguero, R. Jacquier et H. C. N. Tien Duc  
Compt. Rend. Ser. C, 263, 1456 (1966)

"Lithium Tetrakis-(N-Dihdropyridyl)-Aluminate: Structure  
and Reactivity"  
J. O. Peterson  
Dissertation Abstr., B. Sci. Eng. 27, 60 (1966)

"Some Aspects of the Chemistry of Imidazo(1,2-a)pyridine"  
H. L. Blewitt  
Dissertation Abstr., B. Sci. Eng. 27, 97 (1966)

"Part 1: Magnetic Non-Equivalence of Methylene Protons in  
Dissymmetric Benzylamines. A Simple Method of Assignment  
of Configuration of Identically  $\alpha$ , $\alpha'$ -Disubstituted Hetero-  
cyclic Bases. Part 2: The Stereochemistry of Pinidine.  
Part 3: The Stevens Rearrangement: Its Mechanism and  
Stereochemistry"  
T.-H. Chan  
Dissertation Abstr., B. Sci. Eng. 27, 98 (1966)

"The Stereochemistry of Sulfoxide in the Base-Catalyzed Hydrogen-Isotopic Exchange of Aryl-Methyl Sulfoxide"  
Y.-H. Khim, W. Tagaki, M. Kise, N. Furukawa and S. Oae  
Bull. Chem. Soc. Japan 39, 2556 (1966)

"Degradation of Carbohydrates. Part VIII. Formation of a 3(2H)-Furanone from Hex-2-Enofuranoles"  
E. F. L. J. Anet  
Carbohydrate Res. 2, 448 (1966)

"Teil III. Strukturaufklärung der Additionsprodukte von Benzylmercaptan und D-Glucal"  
J. Lehmann and H. Friebolin  
Carbohydrate Res. 2, 499 (1966)

"Long-range Coupling in  $\alpha$ - and  $\beta$ -Fluoro-Substituted Pentafluorostyrenes"  
D. D. Callander, P. L. Coe, M. F. S. Matough, E. F. Mooney, A. J. Uff, and P. H. Winstan  
Chem. Commun. 820 (1966)

"Synthesis of a Unique Fatty Acid From Exocarpus Seed Oil"  
J. A. Elix and M. V. Sargent  
Chem. Commun. 823 (1966)

"The Structure and Synthesis of Undecylprodigiosin. A Prodigiosin Analogue from Streptomyces"  
H. H. Wasserman, G. C. Rodgers, Jr., and D. D. Keith  
Chem. Commun. 825 (1966)

"Phenanthridine 5-Oxides with Acetylenic Esters and the Preparation of Dibenzo[e,g]indolizine"  
R. M. Acheson, A. S. Bailey, and I. A. Selby  
Chem. Commun. 835 (1966)

"Nuclear Spin-Spin Interactions.  $^{14}\text{N}-^1\text{H}$  Spin-Spin Coupling in Quaternary Enammonium Salts"  
J. M. Lehn and R. Seher  
Chem. Commun. 847 (1966)

"Preparation and Properties of  $[\pi-(\text{C}_6\text{H}_5)_4\text{C}_4]\text{Pd}(\pi-\text{B}_9\text{C}_{2\text{H}}_{11})$ "  
P. A. Wegner and M. F. Hawthorne  
Chem. Commun. 861 (1966)

"Conformational Isomerization in Hexahydro-1,3,5-tri-methyl-s-triazine"  
R. F. Farmer and J. Hamer  
Chem. Commun. 866 (1966)

"Grandifolione: A Novel Tetrnortriterpenoid"  
J. D. Connolly, K. L. Handa, R. McCrindle, and K. H. Overton  
Chem. Commun. 867 (1966)

"A Relationship between Coupling Constants in E.s.r. and N.m.r. Spectra"  
W. T. Dixon  
Chem. Commun. 870 (1966)

"Strained Systems: Cubane"  
C. G. Chin, H. W. Cuts, and S. Masamune  
Chem. Commun. 880 (1966)

"A Novel Type of Long-range Spin Coupling Across Five Single Bonds"  
K. Tori and Masako Ohtsuru  
Chem. Commun. 886 (1966)

"Nuclear Magnetic Resonance Contact Shifts of Substituted Paramagnetic Metallocenes"  
M. F. Rettig and R. S. Drago  
Chem. Commun. 891 (1966)

"Thermal Decomposition of the Diphenyldiazomethane Adducts of 1,4-Naphthaquinone"  
P. G. Jones  
Chem. Commun. 894 (1966)

"The Photo-oxidation of Tropolone Methyl Ether"  
E. J. Forbes and J. Griffiths  
Chem. Commun. 896 (1966)

"Formation of Two Different Entities on Protonation of Formic Acid"  
H. Hogeweegen, A. F. Bickel, C. W. Hilbers, E. L. Mackor and C. MacLean  
Chem. Commun. 898 (1966)

"Ready Formation of the 2,2'-Bipyrrolidinyl System"  
J. B. Bapat and D. St. C. Black  
Chem. Commun. 902 (1966)

"Reaction of 2,3:6,7-Di-O-isopropylidene-5-O-toluene-p-sulphonyl-D-glycero-D-gulo-heptofuranose with Sodium Methoxide: a Possible Case of Intramolecular Trans-tosylation"  
J. S. Brimacombe and L. C. N. Tucker  
Chem. Commun. 903 (1966)

"Annulene" Dependence of Nuclear Magnetic Resonance Spectrum on Temperature"  
I. C. Calder and F. Sondeheimer  
Chem. Commun. 904 (1966)

"A Revised Structure for Averufin"  
P. Roffey and M. V. Sargent  
Chem. Commun. 913 (1966)

"Insect Hormones. The Structure of Ponasterone A, an Insect-moultling Hormone from the Leaves of Podocarpus nakaai Hay"  
K. Nakanishi, M. Koreeda, S. Sasaki, M. L. Chang, and H. Y. Hsu  
Chem. Commun. 915 (1966)

"The Isolation of a Bicyclic Aziridinium Ion Intermediate"  
C. F. Hammer and S. R. Heller  
Chem. Commun. 919 (1966)

" $^{29}\text{Si}-\text{H}$  Spin Coupling Constants"  
E. O. Bishop and M. A. Jensen  
Chem. Commun. 922 (1966)

"Taxa-4(16,11-diene-5 $\alpha$ ,10 $\alpha$ ,13 $\alpha$ -tetraol, a New Taxane Derivative from the Heartwood of Yew (T. baccata L.): X-Ray Analysis of a p-Bromobenzoate Derivative"  
W. R. Chan, T. G. Halsall, G. M. Hornby and A. W. Oxford  
Chem. Commun. 923 (1966)

"Stereochemistry of Some Keto-epoxides"  
S. O'Connor, W. I. O'Sullivan and E. M. Philbin  
Chem. Ind. (London) 1925 (1966)

"Reactivity of Dodecarbonyltriruthenium"  
J. P. Cardin, K. K. Joshi and D. T. Thompson  
Chem. Ind. (London) 1960 (1966)

"A New Rearrangement of Sulphonium Ylids"  
K. W. Ratts and A. N. Yao  
Chem. Ind. (London) 1963 (1966)

"Isolation of an Intermediate in the Rearrangement of 1-Ethoxy-9-ethyladenine to 6-Ethoxy-amino-9-ethylpurine"  
T. Fujii, T. Itaya, C. C. Wu and S.-i. Yamada  
Chem. Ind. (London) 1967 (1966)

"A Total Synthesis of Phytol"  
K. Sato, S. Mizuno, and M. Hirayama  
J. Org. Chem. 32, 177 (1967)

"1,4,9,10-Tetrahydroanthracene from the Stepwise Reduction of 9,10-Dihydroanthracene by Lithium in Ammonia"  
R. G. Harvey  
J. Org. Chem. 32, 238 (1967)

"A Total Synthesis of Astaxanthin Dimethyl Ether"  
J. D. Surmatis and R. Thommen  
J. Org. Chem. 32, 180 (1967)

"Transformations of Fusidic Acid. III. 17-Oxa-4 $\alpha$ ,8,14-Trimethyl- $\beta$ -Homo-18-norandrostanes"  
G. W. Krakower, H. A. Van Dine, P. A. Diassi, and I. Bacso  
J. Org. Chem. 32, 184 (1967)

"C-18 Functional Steroids and D-Homo Steroids"  
H. Lee and M. E. Wolff  
J. Org. Chem. 32, 192 (1967)

"The Bridge Chemistry of Paracyclophanes. The Mono- and Dichloroformylation of [2.2]Paracyclophane (Di-p-xylylene) with Oxalyl Chloride"  
E. Hedaya and L. M. Kyle  
J. Org. Chem. 32, 197 (1967)

"Chlorination of Benzylic Sulfides with N-Chlorosuccinimide"  
D. L. Tuleen and V. C. Marcum  
J. Org. Chem. 32, 204 (1967)

"Chemistry of Dimethylketene Dimer. VI. Reactions of the  $\beta$ -Lactone Dimer of Dimethylketene with Enamines"  
J. C. Martin, R. D. Burpitt, and H. U. Hostettler  
J. Org. Chem. 32, 210 (1967)

"A Versatile New Enamine Synthesis"  
W. A. White and H. Weingarten  
J. Org. Chem. 32, 213 (1967)

"A Novel Condensation Reaction of  $\alpha$ , $\beta$ -Unsaturated Cyclic Ketones with Ammonium Thiocyanate"  
G. Kabas  
J. Org. Chem. 32, 218 (1967)

"Paracyclophane Phenols and Derivatives. I. The Synthesis and pKa Values of 4-Hydroxy- and 4-Amino[2.2]paracyclophane"  
B. E. N. Gross, D. Becker, R. I. Cukier, and R. M. Schultz  
J. Org. Chem. 32, 220 (1967)

"Oxymercuration of Allenes"  
R. K. Sharma, B. A. Shoulders, and P. D. Gardner  
J. Org. Chem. 32, 241 (1967)

"Senecio Alkaloids. Synthesis of Sarracinic Acid"  
J. D. Edwards, Jr., T. Matsumoto, and T. Hase  
J. Org. Chem. 32, 244 (1967)

"Reaction of Pyrrolidine with P-1-Aziridinyl-N,N',N'-tetramethylphosphonic Diamides"  
P. E. Sonnet  
J. Org. Chem. 32, 248 (1967)

"An Improved Synthesis of 3-Cyclopentene-1-Carboxylic Acid from 1,4-Dichlorobutene-2"  
G. H. Schmid and A. W. Wolkoff  
J. Org. Chem. 32, 254 (1967)

"Halomethyl-Metal Compounds. VI. Phenyl(Dihalomethyl) Mercury Compounds: Their Preparation and Some Cleavage Reactions"  
D. Seyerth and H. D. Simmons, Jr.  
J. Organometal. Chem. 6, 306 (1966)

"The Proton Magnetic Resonance Spectra of Some Ethylgermanium Compounds"  
K. M. Mackay and R. Watt  
J. Organometal. Chem. 6, 336 (1966)

"Solvates of Some Methyllead Compounds and Their  $^{207}\text{Pb}$ -CH<sub>3</sub> Coupling Constants"  
G. D. Shier and R. S. Drago  
J. Organometal. Chem. 6, 359 (1966)

"Perfluoroalkyl Arsenicals. X. Some Reactions of Secondary Arsines and Diarsines With Fluoroolefins"  
W. R. Cullen, P. S. Dhalwal and G. E. Stylian  
J. Organometal. Chem. 6, 364 (1966)

"Some Reactions of 1,5-cyclooctadienepalladium(II) Dichloride"  
R. G. Schultz  
J. Organometal. Chem. 6, 435 (1966)

"The Preparation of Ferrocenylmethyl Alkyl Sulfides from Alkyl Ferrocenethiolcarboxylates"  
D. E. Bublitz  
J. Organometal. Chem. 6, 436 (1966)

"Preparation of some  $\alpha$ - and  $\beta$ -Hydroxyalkyl Silicon Compounds"  
M. Kumada, N. Imaki and K. Yamamoto  
J. Organometal. Chem. 6, 490 (1966)

"Functionally-substituted Organogermanium Compounds"  
I. F. Lutsenko, Yu. I. Baukov and G. S. Burlachenko  
J. Organometal. Chem. 6, 496 (1966)

"The Proton Magnetic Resonance Spectra and Electrical Dipole Moments of Methyltin Halides"  
E. V. Van den Berghe and G. P. Van der Kelen  
J. Organometal. Chem. 6, 515 (1966)

"Alkyl Redistribution Reactions of (CH<sub>3</sub>)<sub>n</sub>SnX<sub>4-n</sub> Compounds (X=Cl, Br, I)"  
E. V. van den Berghe and G. P. van der Kelen  
J. Organometal. Chem. 6, 522 (1966)

"Spektroskopische Untersuchungen an Metallorganischen Verbindungen. XXXIX. <sup>1</sup>H-NMR-Spektren des Zeise'schen Salzes und Einiger Homologer"  
H. P. Fritz, K. E. Schwarzhans und D. Sellmann  
J. Organometal. Chem. 6, 551 (1966)

"The Preparation of Trihalogenomethyltin Compounds"  
A. G. Davies and T. N. Mitchell  
J. Organometal. Chem. 6, 568 (1966)

"Reactions of Metal Carbonyl anions with Pentafluoropyridine and Pentafluorobenzonitrile"  
B. L. Booth, R. N. Haszeldine and M. B. Taylor  
J. Organometal. Chem. 6, 570 (1966)

"Diethylbis(dipyridyl)cobalt. A Butadiene Dimerization Catalyst"  
T. Saito, Y. Uchida, A. Misono, A. Yamamoto, K. Morifuji and S. Ikeda  
J. Organometal. Chem. 6, 573 (1966)

"Halogenated Organotin Compounds as CX<sub>2</sub> Transfer Agents"  
D. Seyerth, F. M. Armbrecht, Jr., B. Prokai, and R. J. Cross  
J. Organometal. Chem. 6, 573 (1966)

"The Stereochemistry of the Cinchona Alkaloids"  
L. K. Keefer  
Dissertation Abstr., B, Sci. Eng. 27, 757 (1966)

"Syntheses of Polyfunctional Cyclopropanes"  
Y. C. Kim  
Dissertation Abstr., B, Sci. Eng. 27, 757 (1966)

"A Structural Investigation of the Alkaloids of  
Cephalotaxus Drupacea"  
J. B. McKay  
Dissertation Abstr., B, Sci. Eng. 27, 563 (1966)

"The Mechanism of the Bromination of 2-Norbornyllithium"  
G. E. Neal  
Dissertation Abstr., B, Sci. Eng. 27, 764 (1966)

"I. Nuclear Magnetic Resonance Studies of Hyperconjugation.  
II. Quantitative Carbanion Studies"  
W. C. Ripka  
Dissertation Abstr., B, Sci. Eng. 27, 767 (1966)

"Magnetic Resonance Studies of ortho- Substituted  
Derivatives of Triphenylmethane"  
M. J. Sabacky  
Dissertation Abstr., B, Sci. Eng. 27, 768 (1966)

"Studies in Thiophene Chemistry: Aminothiophenes"  
L. K. Lala  
Dissertation Abstr., B, Sci. Eng. 27, 771 (1966)

"Indirect Nuclear Spin-Spin Coupling and Isotope  
Chemical Shift in High Resolution NMR Spectra"  
H. Batiz-Hernandez  
Dissertation Abstr., B, Sci. Eng. 27, 772 (1966)

"Carbon-13 Nuclear Magnetic Resonance of Substituted  
Linear Alkanes"  
T. D. Brown  
Dissertation Abstr., B, Sci. Eng. 27, 772 (1966)

"The Theory of C-13 NMR Chemical Shifts in Linear Alkanes  
and Certain Carbonyl Compounds"  
B. V. Cheney  
Dissertation Abstr., C, Sci. Eng. 27, 773 (1966)

"Magnetic Susceptibility and Nuclear Magnetic Resonance  
Investigation of Group IVz, Va and VIA Transition  
Metal Monophosphides"  
B. A. Scott  
Dissertation Abstr., B, Sci. Eng. 27, 786 (1966)

"<sup>1</sup>H - <sup>1</sup>H and <sup>1</sup>H - <sup>31</sup>P Spin-Spin Interactions in Some New  
Bicyclo[2.2.2]Octane Derivatives"  
E. J. Boros, Jr.  
Dissertation Abstr., B, Sci. Eng. 27, 1075 (1966)

"The Chemistry of Bicyclo(2.2.2)-2,5,7-Octatriene  
(Barrelene)"  
G. L. Grunewald  
Dissertation Abstr., B, Sci. Eng. 27, 1087 (1966)

"A Nuclear Magnetic Resonance Study of Amides and  
Polypeptides"  
W. E. Stewart  
Dissertation Abstr., B, Sci. Eng. 27, 1119 (1966)

"The Proton Magnetic Resonance (P.M.R.) Spectra of  
Certain 12-Heteropolyacids"  
V. F. Chuvaev and Academician V. I. Spitsyn  
Dok.-Phys. Chem. Sect. (English Transl.) 166, 9 (1966)

"Chemical Shifts and Spin-Spin Interaction Constants of  
Protons of the H - N - N and H - C = N - N Groups"  
V. S. Stopakii, V. B. Lebedev, B. V. Ioffe, and A. A. Petrov  
Dok.-Phys. Chem. Sect. (English Transl.) 166, 19 (1966)

"Use of Nuclear Magnetic Resonance to Study Variously  
Substituted Salts of Cerimolybdic Acid"  
V. F. Chuvaev, G. G. Stepanova, E. A. Torchennova,  
and Academician V. I. Spitsyn  
Dok.-Phys. Chem. Sect. (English Transl.) 166, 26 (1966)

"Relaxation of Protons and Deuterons in Aqueous Solutions  
of Pentavalent Molybdenum"  
R. K. Mazitov  
Dok.-Phys. Chem. Sect. (English Transl.) 166, 87 (1966)

"Sull'azione del reattivo di Vilsmeier su chetosteroidi  
e derivati"  
R. Sciaky e U. Pallini  
Gazz. Chim. Ital. 96, 1254 (1966)

"Struttura della lucesomicina"  
G. Gaudiano, P. Bravo e A. Quilico  
Gazz. Chim. Ital. 96, 1322 (1966)

"Struttura della lucensomicina: Nota II"  
G. Gaudiano, P. Bravo e A. Quilico  
Gazz. Chim. Ital. 96, 1351 (1966)

"Proton Nuclear Magnetic Resonance Studies of Ethylene-  
diaminetetraacetic Acid Complexes of Zirconium(IV),  
and Palladium(II)"  
Y. O. Aochi and D. T. Swayer  
Inorg. Chem. 5, 2085 (1966)

"Nuclear Magnetic Resonance Study of Some Cobalt(III)  
Complexes with Known Chelate Ring Conformations"  
S. T. Spees, Jr., L. J. Durham, and A. M. Sargeson  
Inorg. Chem. 5, 2103 (1966)

"Pentacoordinated Molecules. VIII. Preparation and  
Nuclear Magnetic Resonance Study of PH<sub>2</sub>F<sub>3</sub> and PHF<sub>4</sub>"  
R. R. Holmes and R. N. Storey  
Inorg. Chem. 5, 2146 (1966)

"Boron-Nitrogen Compounds. XXVI. A Spectroscopic Study  
of Dimethylaminovinylbromoborane"  
K. Niedenzu, J. W. Dawson, G. A. Neece, W. Sawodny,  
D. R. Squire, and W. Weber  
Inorg. Chem. 5, 2161 (1966)

"Relative Acidities of Some Hydrides of Groups IV and V  
in Liquid Ammonia. Nuclear Magnetic Resonance Spectra of  
the Hydrides and Their Anions"  
T. Birchall and W. L. Jolly  
Inorg. Chem. 5, 2177 (1966)

"Preparation and Properties of Some New Trifluoromethane-  
sulfonates"  
R. E. Nottle and G. H. Cady  
Inorg. Chem. 5, 2182 (1966)

"Reactions of Bromine(I) Fluorosulfate with Simple Inorganic  
Molecules and Polyfluoroolefins. A Novel Route to  
Perfluoro-2,3-butanedione"  
B. L. Earl, B. K. Hill, and J. M. Shreeve  
Inorg. Chem. 5, 2184 (1966)

"Metal Complexes of Unsaturated Tertiary Phosphines and  
Arsines. III. Group VI Metal-Olefin Complexes. An  
Unusual Metal-Catalyzed Olefin Isomerization"  
L. V. Interrante, M. A. Bennett, and R. S. Nyholm  
Inorg. Chem. 5, 2212 (1966)

"Organometallic Compounds with Metal-Metal Bonds. IV.  
Pentacarbonylmanganese and Pentacarbonylrhodium  
Derivatives of Silicon, Germanium, Tin, and Lead.  
Preparation and Infrared and Nuclear Magnetic Resonance  
Studies"  
W. Jetz, P. B. Simons, J. A. J. Thompson and W. A. Graham  
Inorg. Chem. 5, 2217 (1966)

"An NMR Study of Hydrogen-Bonding in Substituted Phenols"  
V. S. Griffiths and G. Socrates  
*J. Mol. Spectr.* 21, 302 (1966)

"Multiplicity of Solutions of the Inverse Secular Problem"  
S. Toman and J. Pliva  
*J. Mol. Spectr.* 21, 362 (1966)

"An NMR Study of 1-Indanone. Analysis of A<sub>2</sub>B<sub>2</sub> Spectra"  
S. Forsén  
*J. Mol. Spectr.* 21, 372 (1966)

"The Effect of Halide Salts on the NMR Spectrum of Methanol"  
R. M. Hammaker and R. M. Clegg  
*J. Mol. Spectr.* 22, 109 (1967)

"Proton Magnetic Resonance Spectrum and Nuclear Overhauser Effects of N-Methylmethylenimine"  
C. F. Chang, B. J. Fairless, M. R. Willcott, R. F. Curl, Jr., J. Hinze, D. F. Hoster and A. Danti  
*J. Mol. Spectr.* 22, 112, (1967)

"The Long Range Spin-Spin Coupling in the Carboxylic Acid Esters"  
K. Hayamizu and O. Yamamoto  
*J. Mol. Spectr.* 22, 119 (1967)

"Conformational Preferences in Diastereomers. II"  
C. A. Kingsbury and D. C. Best  
*J. Org. Chem.* 32, 6 (1967)

"The Electrochemical Oxidation of Cyclooctatetraene in Acetic Acid Containing Acetate Ion"  
L. Eberson, K. Nyberg, M. Finkelstein, R. C. Petersen, S. D. Ross, and J. J. Uebel  
*J. Org. Chem.* 32, 16 (1967)

"Reactive Intermediates in the Bicyclo[3.1.0]hexyl and Bicyclo[3.1.0]hexylidene Systems. III. The Addition of Hydrogen Chloride and Deuterium Chloride to Bicyclo[3.1.0]hexene-2"  
P. K. Freeman, F. A. Raymond, and M. F. Groat  
*J. Org. Chem.* 32, 24 (1967)

"1,2-Diphenylcyclobutene"  
R. M. Dodson and A. G. Zielske  
*J. Org. Chem.* 32, 28 (1967)

"Bridged Ring Compounds. VII. 1-Halobicyclo[2.2.2]octanes"  
Z. Suzuki and K.-I. Morita  
*J. Org. Chem.* 32, 31 (1967)

"The Bird-Cage Ketone, Hexacyclo[5.4.1.0<sup>2,6</sup>.0<sup>3,10</sup>.0<sup>5,9</sup>.0<sup>8,11</sup>]dodecan-4-one, and Some of Its Derivatives"  
R. J. Stedman and L. S. Miller  
*J. Org. Chem.* 32, 35 (1967)

"Tetracyanocyclopentadienide Chemistry"  
O. W. Webster  
*J. Org. Chem.* 32, 39 (1967)

"Synthetic Approaches to Cyclohept[f]indenes"  
F. G. Bordwell and M. Winn  
*J. Org. Chem.* 32, 42 (1967)

"ortho Claisen Rearrangement of Allyloxy-Substituted Isoquinolines"  
H. Win and H. Tieckelmann  
*J. Org. Chem.* 32, 59 (1967)

"Attempted Preparation of New Phenanthrenequinone Types"  
M. S. Newman and R. L. Childers  
*J. Org. Chem.* 32, 62 (1967)

"Some Diels-Alder Reactions of Naphthacene"  
J. S. Meek, F. M. Dewey, and M. W. Hanna  
*J. Org. Chem.* 32, 69 (1967)

"Reactions of Aziridines. I. A Mechanism of Piperazine Formation from Aziridines"  
C. R. Dick  
*J. Org. Chem.* 32, 72 (1967)

"Azetidinyl Ketones. II. Synthesis, Epimerization, and Nuclear Magnetic Resonance Spectra of 1-t-Butyl-2-phenyl-3-benzoylazetidines"  
J.-L. Imbach, E. Doomes, R. P. Rebman and N. H. Cromwell  
*J. Org. Chem.* 32, 78 (1967)

"Some Unusual Reactions of Hydrazines with a Hindered Steroidal  $\alpha$ -Amino Ketone"  
D. F. Morrow, M. E. Butler, W. A. Neuklis, and R. M. Hofer  
*J. Org. Chem.* 32, 86 (1967)

"Acylated Hydrazine Mustards"  
B. T. Gillis and R. E. Kadunce  
*J. Org. Chem.* 32, 91 (1967)

"The Synthesis and Spectra of  $\alpha,\beta$ -Unsaturated Aliphatic Azoxy Compounds"  
B. T. Gillis and J. D. Hagarty  
*J. Org. Chem.* 32, 95 (1967)

"Alkynyllithium Compounds from the Reaction of 1-Alkenes with Lithium"  
D. L. Skinner, D. J. Peterson and T. J. Logan  
*J. Org. Chem.* 32, 105 (1967)

"The Reduction of Malonic Enolates with Lithium Aluminum Hydride"  
J. A. Marshall, N. H. Andersen, and A. R. Hochstetler  
*J. Org. Chem.* 32, 113 (1967)

"Preparation and Reactions of Ferrocenyl(trichloromethyl)carbinol and of Metal Derivatives of Ferrocene"  
W. Reeve and E. F. Group, Jr.  
*J. Org. Chem.* 32, 122 (1967)

"Nucleophilic Displacement Reactions on Organophosphorus Esters by Grignard Reagents. III. The Reaction of Alkyl Diphenylphosphinates with Alkyl Grignards"  
K. D. Berlin and R. U. Pagilagan  
*J. Org. Chem.* 32, 129 (1967)

"Thermal Decomposition of t-Butylperoxy 6-Bromohexanoate. Lack of Evidence for Radical Displacement on Carbon and 1,5-Bridged Bromine Radicals"  
W. S. Trahanovsky and M. P. Doyle  
*J. Org. Chem.* 32, 146 (1967)

"Neighboring-Group Participation across a Furanose Ring. Synthesis of 5-Acetamido-5-deoxy-D-lyxopyranose from D-Arabinose Precursors"  
S. Hanessian  
*J. Org. Chem.* 32, 163 (1967)

"Purine Nucleosides of  $\beta$ -D-Lyxofuranose"  
E. J. Reist, D. F. Calkins, and L. Goodman  
*J. Org. Chem.* 32, 169 (1967)

"The Preparation of 2(5H)-Furanones and Dyes Derived from Them"  
J. A. Ford, Jr., C. V. Wilson and W. R. Young  
*J. Org. Chem.* 32, 173 (1967)

"The Structure of Thymine Photo-dimer"  
G. M. Blackburn and R. J. H. Davies  
J. Chem. Soc., C, Organic 2239 (1966)

"N-Heteroaralkyl Substituted  $\alpha$ -Amidinium Thiolsulfates"  
A. P. Parulkar and L. Bauer  
J. Heterocyc. Chem. 3, 472 (1966)

"The Synthesis and Some Reactions of an N-Hydroxypyrazole-N<sup>1</sup>-oxide"  
J. P. Freeman and J. J. Gannon  
J. Heterocyc. Chem. 3, 544 (1966)

"Reactions with Diazoalkanes Part IV. Action of  
Diazoalkanes and Allied Compounds on 1-(2H)-Naphtha-  
lenone-3, 4-Dihydro-2-Arylidene"  
W. I. Awad, A. H. Moustafa, and A. R. A. Raouf  
J. Chem. U.S.A.R. 8, 137 (1965)

"Synthetic Experiments Related to the Indole Alkaloids V.  
Mercuric Acetate Oxidation of 2-[2-(3-Indolyl)ethyl]-  
1,2,3,4-tetrahydroisoquinolines and the Formation of  
Benz[ $\alpha$ ]indolo-[3,2-h]quinolizine Derivatives(1)"  
K. T. Potts, S. K. Roy and D. R. Liljegren  
J. Heterocyc. Chem. 3, 395 (1966)

"New Reactions of Pyrroles. I. Pyridylethylpyrroles"  
J. L. Archibald  
J. Heterocyc. Chem. 3, 409 (1966)

"The Synthesis of 1,4,5-Trialkyl-2-pyrazolines from Mono-  
alkylhydrazines and Aliphatic Aldehydes (I)"  
N. Rabjohn, H. R. Havens, and J. L. Rutter  
J. Heterocyc. Chem. 3, 413 (1966)

"Stereochemical Studies on 7-Substituted 8-Oxa-1-  
azabicyclo[4.3.0]nonanes"  
T. A. Crabb and R. F. Newton  
J. Heterocyc. Chem. 3, 418 (1966)

"Synthesis and Nucleophilic Displacement Reactions of  
Fluoropyrazine and 2-Fluoroquinoxaline"  
H. Rutner and P. E. Spoerri  
J. Heterocyc. Chem. 3, 435 (1966)

"Deuterium Exchange of 4-Pyrimidones and 4-Pyrimidithiones"  
G. E. Wright, L. Bauer and C. L. Bell  
J. Heterocyc. Chem. 3, 440 (1966)

"Synthesis of Isatin-N-Mannich Bases"  
R. S. Varma and W. L. Nobles  
J. Heterocyc. Chem. 3, 462 (1966)

"Thiaindanones III. Beckmann Rearrangement of Oximes"  
K. Aparajithan, A. C. Thompson and J. Sam  
J. Heterocyc. Chem. 3, 466 (1966)

"Stereochemistry of *cis*- and *trans*-1-Hydroxy-1-phenyl-  
quinolizidines"  
J. D. England and J. Sam  
J. Heterocyc. Chem. 3, 482 (1966)

"5-Amino-5-deoxyribose Derivatives. Synthesis and Use in  
the Preparation of "Reversed" Nucleosides"  
N. J. Leonard and K. L. Caraway  
J. Heterocyc. Chem. 3, 485 (1966)

"Organosilicon Compounds I. A Novel Synthesis of Organo-  
silicon Substituted Furfurals"  
S. F. Thames and H. C. Odom, Jr.  
J. Heterocyc. Chem. 3, 490 (1966)

"A Facile Synthesis of Piperazines from Primary Amines"  
D. W. Henry  
J. Heterocyc. Chem. 3, 503 (1966)

"The Synthesis of Pyrazino[2,3-d]pyridazine and Some of  
its Derivatives"  
N. R. Patel and R. N. Castle  
J. Heterocyc. Chem. 3, 512 (1966)

"Reduction of Oxazolinium Salts to Oxazolidine: A New  
Route from Carboxylic Acids to Aldehydes"  
I. C. Nordin  
J. Heterocyc. Chem. 3, 531 (1966)

"Structure of 2,4,6<sup>1</sup>,8<sup>1</sup>-Tetramethyl-2<sup>4</sup>,6,8-tetra-  
phenylcyclotetrasiloxane"  
E. D. Pierron, C. F. Hobbs, D. L. Parker and D. J. Bauer  
J. Heterocyc. Chem. 3, 533 (1966)

"Quinazolines III (1). The Structures of the Products  
Obtained by the Condensation of o-Aminoacetophenone with  
Methyl Isocyanate and Methyl Isothiocyanate"  
R. F. Smith  
J. Heterocyc. Chem. 3, 535 (1966)

"Formation of a 1,2-Azaphosphorine Under the Conditions  
of the Bischler-Napieralski Reaction"  
G. C. Morrison, R. O. Waite and J. Shavel, Jr.  
J. Heterocyc. Chem. 3, 540 (1966)

"A Total Synthesis of (F)-Isoliensinine"  
T. Kametani, S. Takano, and K. Satoh  
J. Heterocyc. Chem. 3, 546 (1966)

"Preparation and Properties of Tetramethyldisiloxy-  
dialuminium"  
J. F. Salmon, S. J. Evers and E. C. Evers  
J. Inorg. Nucl. Chem. 28, 2787 (1966)

"Preparation and Characterization of Some Binary and  
Ternary Metal Complexes of Thenoyl trifluoroacetone and  
Phosphorus Esters"  
G. N. Rao and N. C. Li  
J. Inorg. Nucl. Chem. 28, 2931 (1966)

"Properties of Xenon Fluoride Adducts"  
B. Cohen and R. D. Peacock  
J. Inorg. Nucl. Chem. 28, 3056 (1966)

"Solvent Dependent H-H Couplings in 2,2-Dichlorocyclo-  
propylbenzene"  
R. H. Cox and S. L. Smith  
J. Mol. Spectr. 21, 232 (1966)

"Analysis of <sup>13</sup>C-H Satellite Spectrum of Benzene"  
J. M. Read, Jr., R. E. Mayo, and J. H. Goldstein  
J. Mol. Spectr. 21, 235 (1966)

"A Simplified Method of Analysis of a Large Spin System:  
Perfluoro n-Butane"  
R. C. Hopkins  
J. Mol. Spectr. 20, 321 (1966)

"The Stereochemical Significance of the Long-Range Proton  
Spin Coupling Constant of the  $\sigma$ -Fragment H-C-C-C-H"  
V. F. Bystrov and A. U. Stepanovants  
J. Mol. Spectr. 21, 241 (1966)

"The Effect of Aromatic Solvents on the NMR Parameters  
of  $\alpha$ -Chloroacrylonitrile"  
V. S. Watts and J. H. Goldstein  
J. Mol. Spectr. 21, 260 (1966)