

CONTENTS

Preface	xv
1. Phosphorus–Carbon Compounds with p_{π}–p_{π} Bonds: Opening Lecture	1
R. Appel	
NEW ORGANIC SYNTHETIC METHODS BASED ON REAGENTS CONTAINING PHOSPHORUS	
Dedicated to Georg Wittig	
2. Selective Bond Formation of Organophosphorus Acids with Functional Groups of Biological Importance	13
L. Horner, R. Gehring, and H.-W. Flemming	
3. Chemical Synthesis and Biological Properties of the 5'-Terminus of Eukaryotic Messenger Ribonucleic Acids (mRNA)	17
T. Hata, M. Sekine, I. Nakagawa, K. Yamaguchi, S. Honda, T. Kamimura, K. Yamaguchi, and K.-I. Miura	
4. Triphenylphosphane-diethylazodicarboxylate: A Useful System for Directed Structural Variation of Carbohydrates	21
E. Zbiral, H. H. Brandstetter, and E. Mark	
5. Synthetic Application of Element Organic Substituted Phosphorus Ylides	25
H. J. Bestmann	
6. Mono-, Di-, and Multi-ylides in Organometallic Chemistry	29
H. Schmidbaur	
7. Synthetic and Spectroscopic Investigations Involving α-Hetero-substituted Phosphonate Carbanions	37
H. Zimmer	
8. A New Approach to Activation of Hydroxy Compounds Using Pentacoordinated Spirophosphoranes	41
J. I. G. Cadogan, I. Gosney, D. Randles, and S. Yaslik	
9. Synthetic Applications of α-Amino Substituted Phosphine Oxides	47
A. van der Gen and N. L. J. M. Broekhof	
10. Reactions of Aziridines, 4-Oxazolines, and Their Derivatives with Alkylidene Phosphoranes and Phosphorus(III) Nucleophiles	51
M. Vaultier and R. Carrié	
11. Phosphonates Containing Sulfur and Selenium: Synthesis, Reactions, and New Applications	55
M. Mikołajczyk, S. Grzejszczak, W. Midura, M. Popielarczyk, and J. Omelanczuk	

12. Umpolung of α,β -Ethylenic Ketones and Aldehydes by Phosphorus Groups	59
H. J. Cristau, J. P. Vors, Y. Beziat, C. Niangoran, and H. Christol	
BIOCHEMISTRY OF PHOSPHORUS COMPOUNDS	
Dedicated to Frank H. Westheimer	
13. Monomeric Metaphosphates in Enzymic and in Enzyme-Model Systems	65
F. H. Westheimer	
14. Stereoelectronic Effects in Phosphate Esters	69
D. G. Gorenstein, R. Rowell, and K. Taira	
15. Stereospecific Synthesis and Assignment of Absolute Configuration at Phosphorus in Nucleoside 3'- and 5'-O-Arylphosphorothioates and Nucleoside Cyclic 3',5'-Phosphorothioates	77
J. Baraniak, Z. J. Leśnikowski, W. Niewiarowski, W. S. Zieliński, and W. J. Stec	
16. The Stereochemistry of Chiral Cyclic Phosphorus Esters: Do Theories of Bond-Forming and Bond-Breaking Processes Fit the Facts?	83
T. D. Inch and C. R. Hall	
17. The Stereochemical Course of the Alkaline Hydrolysis of 1,3,2-Oxazaphospholidine-2-thiones	89
C. R. Hall and T. D. Inch	
18. Hydrolysis of Adenosine 5'-Triphosphate: An Isotope-Labeling Study	93
S. Meyerson, E. S. Kuhn, F. Ramirez, and J. F. Marecek	
19. Nucleoside Phosphorothioates for the Study of Enzyme Mechanisms	99
F. Eckstein	
20. Chiral [^{16}O , ^{17}O , ^{18}O] Phosphate Monoesters for Determining the Stereochemical Course of Phosphokinases	103
G. Lowe, P. M. Cullis, R. L. Jarvest, and B. V. L. Potter	
21. Syntheses and Configurational Assignments of Thymidine 3'- and 5'-(4-Nitrophenyl [^{17}O , ^{18}O] Phosphates)	109
S. Mehdi, J. A. Coderre, and J. A. Gerlt	
22. The Mechanism of Aldehyde-Induced ATPase Activities of Kinases	115
W. W. Cleland and A. R. Rendina	
23. Kinetic and Thermodynamic Studies of Yeast Inorganic Pyrophosphatase	119
B. S. Cooperman	
24. The Role of Histidine Residues and the Conformation of Bound ATP on ATP-Utilizing Enzymes	125
P. R. Rosevear, G. M. Smith, S. Meshitsuka, A. S. Mildvan, P. Desmeules, and G. L. Kenyon	
25. [$^{18}\text{O}/^{16}\text{O}$] ^{31}P -NMR Studies of Phosphoryl Transfer Enzymes	131
J. J. Villafranca, F. M. Raushel, R. P. Pillai, M. S. Balakrishnan, C. DeBrosse, and T. D. Meek	

26. Potential Antiviral Nucleotides D. W. Hutchinson	135
NEW SYNTHETIC METHODS FOR PHOSPHORUS COMPOUNDS	
27. Phosphinomethanes: Synthesis and Reactivity H. H. Karsch	141
28. Preparation and Synthetic Reactions of a-Alkoxyallyl Phosphorus Ylides M. Maleki, J. A. Miller, and O. W. Lever, Jr.	145
29. a-Phosphorylated Carbanions: Synthetic Features G. Sturtz, B. Corbel, M. Baboulène, and J. Yaouanc	149
30. A New Synthesis of Indoles M. Le Corre, A. Hercouet, and H. Le Baron	153
31. Alkylation by Way of Monomeric and Polymeric Alkoxyphos- phonium Salts D. W. Hamp and E. S. Lewis	157
32. Some Preparative and Mechanistic Aspects of the Chemistry of Phosphoric Acid and Thiophosphoric Acid Chloride Betaines M. Meisel, C. Donath, and H. Grunze	161
33. "Activated" Phosphoranes for the Cyclodehydration and Chlorina- tion of Simple Diols S. W. Bass, C. N. Barry, P. L. Robinson, and S. A. Evans, Jr.	165
34. N-Alkylation of Organophosphorus Amides: A New, Convenient Route to Primary and Secondary Amines A. Zwierzak	169
35. Phosphoric Amide Reagents E. B. Pedersen	173
BIOLOGICALLY IMPORTANT PHOSPHORUS COMPOUNDS, NATURAL AND SYNTHETIC	
36. Reversible Masking of Acetylcholinesterase by Covalent Phos- phorylation in the Presence of a Novel Cyclic Phosphate Ester H. Leader, L. Raveh, R. Brukstein, M. Spiegelstein, and Y. Ashani	179
37. a-Aminophosphonous Acids: A New Class of Biologically Active Amino Acid Analogs E. K. Baylis, C. D. Campbell, J. G. Dingwall, and W. Pickles	183
38. Phosphonodipeptides L. Kupczyk-Subotkowska, P. Kafarski, J. Kowalik, B. Lejczak, P. Mastalerz, J. Oleksyszyn, and J. Szewczyk	187
39. Some Aspects of the Chemical Synthesis of Oligodeoxyribonucleo- tides C. B. Reese and L. Valente	191
40. Coupling of Fatty Diazomethylketones with Organophosphorus Acids: An Approach to Glycerophospholipid Analog Synthesis . . . D. A. Marsh and J. G. Turcotte	195
41. Design of Organophosphorus Reagents for Peptide Synthesis R. Ramage, B. Atrash, and M. J. Parrott	199

42. The Nature of the Energy Transduction Links in Mitochondrial Oxidative Phosphorylation	205
F. Ramirez, S.-I. Tu, P. R. Chatterji, H. Okazaki, J. F. Marecek, and B. McKeever	
43. ADP Hydrolysis Promoted by Cobalt(III)	211
M. Hediger and R. M. Milburn	
44. PMR Measurements of Chair-Twist Conformational Equilibria for Diastereomeric P-Derivatives of Thymidine Cyclic 3',5'-Mono- phosphate: Possible Implications for Naturally Occurring Cyclic Nucleotides	217
A. E. Sopchik, G. S. Bajwa, K. A. Nelson, and W. G. Bentruude	
45. Phosphonate Inhibitors of Carboxypeptidase A	221
N. E. Jacobsen and P. A. Bartlett	
46. "Illicit Transport" Systems for Organophosphorus Antimetabolites	225
M. Sheikh, B. Gotlinsky, B. E. Tropp, R. Engel, and T. Parker	

ORGANIC SYNTHETIC METHODS BASED ON REAGENTS
CONTAINING PHOSPHORUS

47. The Preparation of Phosphorus Esters and Thioesters from White Phosphorus	231
C. Brown, R. F. Hudson, G. A. Wartew, and H. Coates	
48. Thermal Rearrangement and Condensation of O,O-Dimethyl-O- Phenylphosphorothionate	235
H. Teichmann and G. Schramm	
49. Synthesis and Reactivity of (Silylamino)phosphines	239
R. H. Neilson, P. Wisian-Neilson, D. W. Morton, and H. R. O'Neal	
50. Addition of Lithium Dialkylcuprates to α,β -Unsaturated Phosphoryl Compounds: Nucleophilic Properties of Adducts	243
R. Bodalski, T. Michalski, J. Monkiewicz, and K. M. Pietrusiewicz	
51. Phosphorylated Ketenes	247
O. I. Kolodyazhnyi, V. I. Yakovlev, and V. P. Kukhar	
52. Preparation and Properties of <i>N</i> -(Hydroxycarbonylmethyl)-aminomethyl Alkyl - and Arylphosphinic Acids and Derivatives	251
L. Maier	
53. Some Aspects of Aminoalkylphosphonic Acids Synthesis by the Reductive Amination Approach	255
P. Savignac and N. Collignon	

PHOSPHORUS HETEROCYCLES

54. Recent Results on Open-Chain and Cyclic Phosphanes and Organylphosphanes	261
M. Baudler	
55. Formation of Phosphorus Oxoacids with P-P-P-P-P and P-P-P-P Frameworks and Related Compounds	267
T. Nakashima, H. Waki, and S. Ohashi	
56. NMR Characterization of Homologous Cyclic Phosphoramides	271
J. E. Richman, R. B. Flay, and O. D. Gupta	

57. Synthesis and Chemical Behavior of Some Bicyclophosphanes	275
C. Bonningue, O. Diallo, D. Houalla, A. Klaebe, and R. Wolf	
58. Reactions of 2,4-Bis(4-methoxyphenyl)-1,3,2,4-dithiadiphosphetane 2,4-Disulfide	279
S.-O. Lawesson	
59. Small Rings with Tervalent Phosphorus	283
E. Fluck and H. Richter	
60. The Unexpected Formation of 1,2-Oxaphosphol-3-ene 2-Oxides in the Reaction of Diacetone Alcohol with Phosphonous Dihalides	287
K. Moedritzer and R. E. Miller	
61. Dihydrophenophosphazines via the Interaction of Diarylamines and Phosphorus Trichloride: Applications and Limitations	291
H. S. Freeman and L. D. Freedman	

PHOSPHAZENES

62. Contributions to the Chemistry of N-Phosphoryl Phosphazenes	297
L. Riesel, E. Herrmann, A. Pfitzner, J. Steinbach, and B. Thomas	
63. Conjugation in Phosphazenes: Pyrrylphosphazenes and Phosphazenyl Carbanions	301
K. D. Gallicano, R. T. Oakley, R. D. Sharma, and N. L. Paddock	
64. Structure, Conformation, and Basicity in Cyclophosphazenes and Related Compounds	307
R. A. Shaw and S. N. Nabi	
65. Phosphazene Rings and High Polymers Linked to Transition Metals or Biologically Active Organic Species	311
H. R. Allcock	
66. Polymerization of Hexachlorocyclotriphosphazene	315
J. W. Fieldhouse and D. F. Graves	
67. Alkenylfluorocyclotriphosphazenes	321
C. W. Allen, R. P. Bright, and K. Ramachandran	
68. The Reactions of Halophosphazenes with Organometallic Reagents	325
P. J. Harris and H. R. Allcock	

NEW ORGANOPHOSPHORUS COMPOUNDS OF COMMERCIAL INTEREST

69. 1,2-Bis(dichlorophosphino)alkanes	333
E. H. Uhing and A. D. F. Toy	
70. Products of Peracid Oxidation of S-Alkyl Phosphorothiolate Pesticides	337
Y. Segall and J. E. Casida	
71. Research on Organophosphorus Insecticides, Synthesis of 0-Alkyl 0-Substituted Phenyl Alkylphosphonothioates	341
Wu Kiun-hou, Sun Yung-min, and Wang Sing-min	
72. Introduction of Phosphorus into the Polyethyleneterephthalate Molecule	345
G. Borisov, K. Troev, and A. Grozeva	

73.	Selected Novel Trivalent Organophosphorus Processing Stabilizers for Polyolefins	351
	J. D. Spivack, A. Patel, and L. P. Steinhuebel	
74.	Oligomeric Phosphorus Esters with Flame Retardant Utility	355
	E. D. Weil, R. B. Fearing, and F. Jaffe	

INORGANIC PHOSPHATES

75.	Crystalline Calcium Polyphosphate Fibers	361
	E. J. Griffith	
76.	Fluorination of Phosphoapatites: Possible Alterations of Their Structure	367
	G. Montel, G. Bonel, J. C. Heughebaert, M. Vignoles, M. Harnad, and G. Bacquet	
77.	Photo- and Thermo-Coloring of Reduced Phosphate Glasses.	371
	Y. Abe, R. Ebisawa, D. E. Clark, and L. L. Hench	
78.	A Gel Chromatographic Study on the Interactions of Long-Chain Polyphosphate Anions with Magnesium Ions	377
	T. Miyajirna, T. Onaka, and S. Ohashi	

COMPOUNDS WITH MONOCOORDINATED AND DICOORDINATED PHOSPHORUS

79.	Phosphaalkenes, $\mathbf{R}_2\mathbf{C}=\mathbf{P}\mathbf{R}'$, and Phosphaalkynes, $\mathbf{R}\mathbf{C}\equiv\mathbf{P}$	383
	H. W. Kroto and J. F. Nixon	
80.	Recent Developments in the Chemistry of Dicoordinated Phosphorus Radicals and Cations	391
	S. G. Baxter, A. H. Cowley, R. A. Kernp, S. K. Mehrotra, and J. C. Wilburn	
81.	$^{31}\mathbf{P}$ NMR Investigations on Dicoordinated Phosphorus Compounds in $\mathbf{P}(\mathbf{II})=\mathbf{C}-\mathbf{P}(\mathbf{III})$ Systems	395
	R. Appel, V. Barth, H. Kunze, B. Laubach, V. Paulen, and F. Knoll	
82.	Synthesis and Properties of Phosphaalkenes	401
	T. A. van der Knaap, T. C. Klebach, F. Visser, R. Lourens, and F. Bickelhaupt	
83.	Routes to Dicoordinated Phosphorus Compounds	405
	K. Issleib, H. Oehrne, H. Schmidt, and G.-R. Vollmer	
84.	Reactions of 2,4,6-Tri(<i>t</i> -butyl)phenyllithium with Phosphorus Halides	409
	M. Yoshifiji, I. Shirna, and N. Inamoto	
85.	Synthesis of New Dicoordinated Phosphorus Compounds with a $\mathbf{P}(\mathbf{III})=\mathbf{N}$ Bond	413
	C. Malavaud, L. Lopez, T. N'Gando M'Pondo, M. T. Boisdon, Y. Charbonnel, and J. Barrans	

COMPOUNDS WITH PENTACOORDINATED AND HEXACOORDINATED PHOSPHORUS

86.	Cyano Anions of Dicoordinated, Tricoordinated, Tetracoordinated, Pentacoordinated, and Hexacoordinated Phosphorus	419
	A. Schmidpeter, F. Zwaschka, and W. S. Sheldrick	

87.	Preparation, Reactions, and Structures of Some <i>N,N'</i>-Dimethyl -urea-Bridged Phosphorus Compounds	425
	N. Weferling and R. Schmutzler	
88.	A Stable Monocyclic Triarylalkoxyhydridophosphorane: A 10-P-5 Species with an Apical P–H Bond	429
	M. R. Ross and J. C. Martin	
89.	Monocyclic Phosphoramide and Phosphoranoxide Anions: P(V) Oxyphosphorane Carbanion—P(IV) Ylide Alkoxide Tautomerism	435
	I. Granoth, R. Alkabets, E. Shirin, Y. Margalit, and P. Bell	
90.	Selectivity in Reactions of Tricyclic Phosphatrances	439
	D. van Aken, I. I. Merkelbach, J. H. H. Hamerlinck, P. Schipper, and H. M. Buck	
91.	The Perfluoropinacolyl Group: A Stabilizing Substituent for Unusual Phosphites and Phosphoranes	443
	G.-V. Rosenthaler, R. Bohlen, and W. Storzer	
92.	Tartaric Acid in Phosphorus Chemistry: Phosphor Emetics and Oligomers	447
	A. Munoz, L. Lamandé, M. Koenig, and R. Wolf	
93.	Nucleophilic Substitution at Pentacoordinated Phosphorus: Addition–Elimination Mechanism	453
	A. Skowrońska, J. Stanek-Gwara, and M. Nowakowski	
NEW PHOSPHORUS LIGANDS AND COMPLEXES (INCLUDING CATALYTIC PROPERTIES)		
94.	Metal Chelates of Aminoalkylphosphonic Acids: Stabilities, Properties, and Reactions	459
	A. E. Martell	
95.	Transition VIB Metal π - Complexes of X ³⁻ and X ⁵⁻ -Phosphorins and Some of Their Reactions	463
	K. Dimroth	
96.	Synthesis of Transition Metal Phosphoranides: Conversion of Bicyclic Phosphoranes into Phosphoranides and Phosphane Adducts with Transition Metal Derivatives	469
	J. G. Riess, F. Jeanneaux, P. Vierling, J. Wachter, and A. Grand	
97.	Secondary Phosphino Macroyclic Ligands	473
	E. P. Kyba and H. H. Heumüller	
98.	Dicoordinated and Tricoordinated Acyclic Phosphazenes as Complex Ligands	477
	O. J. Scherer, H. Jungmann, and R. Konrad	
99.	Metal Complexes of Amino(cyclophosphazenes)	481
	V. Chandrasekhar, S. S. Krishnarnurthy, and M. Woods	
100.	Structural and Magnetic Investigation on Transition Metal Complexes with Tripodal Polytertiary Phosphines	487
	L. Sacconi	
101.	The Use of Alkylaminobis(difluorophosphines) as Ligands to Stabilize Novel Binuclear Complexes	489
	J. H. Kim, K. S. RaghuVeer, T. W. Lee, L. Norskov-Lauritzen, V. Kumar, M. G. Newton, and R. B. King	

102.	New Aspects of the Coordination Chemistry of Carbonyl Phosphines	493
E. F. Landvatter and T. B. Rauchfuss		
103.	New Chiral Aminophosphine Ligands: Application to Catalytic Asymmetric C–C Bond Formation	499
G. Buono, C. Triantaphylides, G. Peiffer, A. Mortreux, and F. Petit		
104.	³¹P NMR Studies of Catalytic Intermediates in Triphenylphosphine Rhodium Complex Hydroformylation Systems	503
A. A. Oswald, J. S. Merola, E. J. Mozeleski, R. V. Kastrup, and J. C. Reisch		
REACTION MECHANISMS INVOLVING ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS		
105.	New Data on the Mechanism of the Perkow–Arbuzov Reaction	513
L. Toke, I. Petnehbzsy, G. Szakbl, H. R. Hudson, L. Powroznik, and C. J. Cooksey		
106.	Structure and Reactivity of Quasiphosphonium Intermediates	517
H. R. Hudson, A. T. C. Kow, and K. Henrick		
107.	Reactions of Triorganosilyl Halides with Esters of Tricoordinated and Tetra coordinated Phosphorus	521
J. Chojnowski, M. Cypryk, J. Michalski, and L. Wozniak		
108.	Halogenolysis of the Phosphorus–Sulfur Bond in Thioesters of Organic Phosphorus Thioacids	525
B. Krawiecka, J. Michalski, and E. Tadeusiak		
109.	Isotope Effects in Amination Reactions of Chlorocyclophosphazenes	529
J. M. E. Goldschmidt, R. Halevi, and E. Licht		
110.	Zwitterionic α -Complexes: Their Role as Intermediates in Phosphorylation of Aromatics by Phosphorus Compounds	533
Y. Gololobov and P. Onys'ko		
111.	Use of X-Ray Structural Results on Phosphorus Compounds in Modeling Reaction Mechanisms	537
R. R. Holmes, J. C. Gallucci, and J. A. Deiters		
112.	Ligand Effects on the Reaction of Alkoxide Ions with Organo-phosphorus Derivatives Containing Multiple Leaving Groups	543
K. E. DeBruin , C. E. Ebersole, M. H. Hughes, and D. M. Johnson		
113.	Methanolysis of a Phosphate Ester	547
W. S. Wadsworth, Jr.		
114.	Reactivity of Tricoordinated Phosphorus Compounds: A Mechanistic Study with a Variety of Substrates	551
C. D. Hall, R. C. Edwards, J. R. Lloyd, P. D. Beer, P. J. Hammond, A. O. d'Amorim , and M. P. Melrose		
STEREOCHEMISTRY OF PHOSPHORUS COMPOUNDS		
115.	A New Stereospecific Synthesis of a P(III) Organophosphorus Ester	557
L. J. Szafraniec, L. L. Szafraniec, and H. S. Aaron		

116. A Single Crystal X-Ray Diffraction Analysis of (1R, 1'S)- 1,1'-Ethylenebis[1,2,3,4-tetrahydro-4,4-dimethyl-1-phenylphosphino-linium] Diperchlorate	561
N. Gurusarny, K. D. Berlin, D. van der Helm, and M. B. Hossain	
117. Stereochemical Investigation of Chiral Onium Hexaarylphosphates	567
G. P. Schiernenz and J. Pistor	
SPECTROSCOPY OF PHOSPHORUS COMPOUNDS	
118. d_π-p_π-Bonding Effects on the ³¹P NMR Chemical Shifts of N-Arylaminophosphoranes	573
P. C. Murphy and J. C. Tebby	
119. ¹H, ¹⁹F, ³¹P , and ¹³C NMR Investigation of Diphosphanes and Triphosphanes	577
J. P. Albrand and C. Taïeb	
120. Principal ³¹P Chemical Shift Tensor Components as Determined by Solid State NMR	581
J. P. Dutasta, J. B. Robert, and L. Wiesenfeld	
121. Application of the ¹⁸O Shift on the ³¹P NMR Spectrum to the Elucidation of Biochemical Phosphate Transfer Mechanisms	585
F. Jordan, S. J. Salarnone, and A. L. Wang	
122. Phospholipase A , Hydrolysis of Phospholipids: Use of ³¹P NMR to Study the Hydrolysis, Acylic Migration, Regiospecific Synthesis, and Solubilization of :Phospholipids	591
A. Plückthun and E. A. Dennis	
PHOTOCHEMISTRY WITH PHOSPHORUS COMPOUNDS	
123. Photolytic Rearrangement of Phosphorus, Germanium, and Silicon Azides: Evidence for New Hybridized Species	597
J. P. Majoral, G. Bertrand, A. Baceiredo, and P. Mazerolles	
124. Diphenylphosphinous Acid by UV Irradiation of Aroyl Diphenyl Phosphines	601
K. Praefcke and M. Dankowski	
BONDING AND THEORY OF PHOSPHORUS COMPOUNDS	
125. Chemical Model Showing Three Phenomena: Phosphorane→Ylide , Ylide→Phosphorane , and Phosphorane≡Ylide	607
R. Burgada, Y. Leroux, and Y. O. El Khoshniah	
126. Base-Catalyzed Reactions of Phosphonomethylphosphinates, Bis(phosphonomethyl)phosphinates, and Bis(phosphonomethyl) -phosphinic Amides with Aldehydes	611
W. F. Gilmore and J. S. Park	
127. Structure–Reactivity Studies on Oxygen-Containing Phosphorus-Based Ligands	615
Yuan Chengye, Ye Weizhen, Zhou Chengning, and Hui Yongzheng	
128. Phosphoric and Carboxylic Amides: Comparison of Bonding and Reactivity	619
T. A. Modro	

Poster Presentations	623
Index	631

Also presented although not included in this volume:
Gas Chromatographic Separation and Identification of the Four Stereoisomers
of *O*-1,2,2-Trimethylpropyl Methylphosphonofluoridate (SOMAN): Stereospecificity of In Vitro and In Vivo "Detoxification" Reactions
H. P. Benschop, C. A. G. Konings, and L. P. A. de Jong
Published in 1981 in the **Journal of the American Chemical Society**, Volume 103, page 4260.