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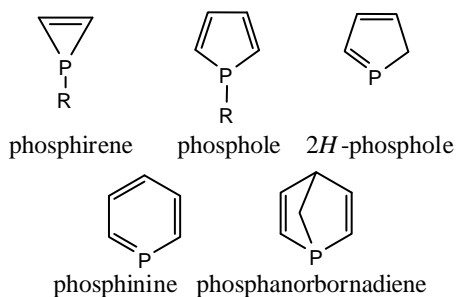


*Major Research Interests:* **Organophosphorus chemistry;**  
**Transition metal chemistry;**  
**Homogeneous catalysis**

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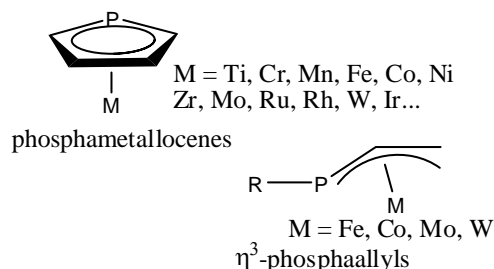
### Heterocyclic phosphorus chemistry

We have published more than 300 papers in this field. We can stress the following points. The phosphirene ring has been discovered in our group. This is the most strained P-C ring with an internal angle of only 42°. We have developed the chemistry of 2*H*-phospholes which mimics the chemistry of cyclopentadienes. Among their various applications is the synthesis of 1-phosphanorbornadienes with a non-invertible phosphorus atom, a very useful feature for their use in enantioselective catalysis. A alpha-connected dimer, the so-called BIPNOR, has proven to be very efficient in asymmetric catalysis. No less than seven different new syntheses of phosphinines have been devised in our group. 2-Functional phosphinines and 2,2'-biphosphinines have been prepared using 2-Zr and 2-Pd derivatives. We are currently investigating the synthesis and chemistry of polyphosphorus macrocycles with invertible tri- or planar dicoordinate phosphorus atoms. Our more general aim is to pave the way for a phosphorus version of supramolecular chemistry. A book summarizing the advances in this field has been published in 2001.



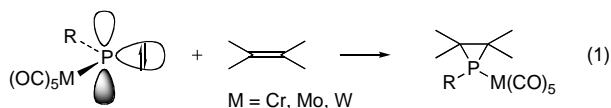
### Phosphorus analogues of unsaturated hydrocarbon pi-complexes

The discovery of phosphoferrocenes in our group was the starting point of the chemistry of pi-phospha-complexes. Since then, we have synthesized numerous other pentahapto-phosphacyclopentadienyl complexes with group 4 to 9 transition metals. They include the paramagnetic 19-electron phosphacobaltocenes and 20-electron phosphanickelocenes. We have also extended our research to main group (Ga, Ge, Sn, Pb) derivatives. The use of phosphoferrocenes and phospharuthenocenes in asymmetric catalysis and phosphazirconocenes in polymerization catalysis has been investigated in several other groups. Also noteworthy is the discovery of the first eta3-1-phosphallyl complexes (M = Fe, Co, Mo, W) which can fluctuate between eta3 and eta1-coordinations.

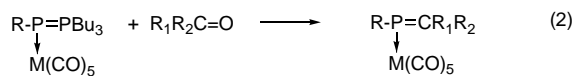


### Low-coordinate phosphorus chemistry

Starting in 1982, we have been developing the chemistry of electrophilic terminal phosphinidene complexes [RPM(CO)<sub>5</sub>]. These species behave as singlet carbenes (eq. 1). Another significant contribution is the synthesis of P=C double bonds from carbonyl derivatives via the phospha-Wittig reaction (eq. 2). We also performed the first successful epoxidations and catalytic hydrogenations of P=C double bonds. All these discoveries illustrate the diagonal carbon-phosphorus analogy. This is the theme of a book published in 1998.



The carbene-like behaviour of terminal phosphinidene complexes



The "phospha-Wittig" reaction

### Selected publications

- N.H Tran Huy, B. Donnadiou, F. Mathey, A. Muller, K. Colby, C.J. Bardeen. A novel family of phosphole-thiophene oligomers for optoelectronic applications. *Organometallics*, **27**, 5521-5524 (2008)
- A. Escobar, B. Donnadiou, F. Mathey. From functional phospholide ions to bifunctional 1,1'-diphosphaferrocenes. *Organometallics*, **27**, 1887-1891 (2008)
- N.H. Tran Huy, B. Donnadiou, F. Mathey. Dithienophosphinine. *Organometallics*, **26**, 6497-6500 (2007)
- F. Mathey. Developing the chemistry of monovalent phosphorus. *Dalton Trans.*, 1861-1868 (2007)