University of Windsor
Chemistry and Biochemistry
Chemistry 59-552, Winter Term 2015
Advanced Main Group Chemistry

Lectures: Lectures will be conducted as needed; they will be held on Thursdays from 10AM-noon in Essex Hall 273 (Chemistry Conference Room)

Professor: Dr. Charles Macdonald (office: 355 Essex Hall (Chemistry); 236 Essex Hall (Science))

Office Hours: Open door

Material:
This course in primarily intended for graduate students and a significant amount of reading outside of class time will be required to comprehend the material and to participate in the discussions during lectures and seminars. The material for the course will be drawn primarily from the current chemical literature and related review articles and book chapters, etc. I will provide handouts during class or post notes on my web site for most topics and provide you with URLs for a number of helpful web sites that contain tutorials or other information of value.

The course web site can be found by selecting the proper link at:

http://mutuslab.cs.uwindsor.ca/macdonald/teaching.htm

Grading for 59-552:
The overall grade will be based on the encyclopedia-style article you prepare (60%), and the seminar you deliver about your subject (40%).

Encylopedia-style paper submission: on or prior to March 31.
The paper will present an area of Main Group relevant to the student in the style of an *Encyclopedia of Inorganic Chemistry* article; more details will be provided in class.

Last Date for Voluntary Withdrawal from Course: March 18, 2015

Course evaluations will be conducted sometime during the final two weeks of class, as per Senate regulations.

Course Outline:

The specific goal of this class is to provide the student with an understanding of several of the current avenues of investigation into the chemistry of the main group elements. More generally, the class will introduce or refresh the student with the tools and approaches that are used to gain insight into how chemical systems work. To this end, we will rapidly become reacquainted with periodic trends, symmetry, group theory and the construction and interpretation of MO diagrams as a prelude to our examination of selected aspects of current chemistry. A solid understanding of such background material is necessary to be able to rationalize the structure, bonding and reactivity of the compounds we will see.

In each topic, we will look at the synthetic methods used to make compounds, the techniques used for their characterization and the methods used to interpret the experimental observations. We will use review articles and the primary literature as the source material.

Topics that we may cover include:
- Models of Bonding.
- Sterically-demanding substituents: The use of bulky groups to control chemistry.
- "Non-existent compounds": The synthesis of compounds that are not supposed to exist.
- Multiple bonding in the main group elements: Why organic chemistry is a special case.
- Main group carbenes analogues.
- Carbene complexes of unusual main group fragments.
- Main group metallocenes.
- Low-oxidation state main group compounds and clusters.
- Single-source precursors: The rational design of materials from suitable building-blocks.
- Main group ligands for transition metal compounds.
- Main group polymers.
- Main group radicaloid species.
- Frustrated Lewis Pairs.

Many of these are inter-related so the topics will not be necessarily covered in this order.