In the summer semester 2011 I will offer a two-hour

**Introduction to the theory of atomic and molecular collisions (5708006).**

Everybody interested in scattering theory and its applications to atomic and molecular collisions is welcome. To fix time and location we will meet on Friday, April 8 at 10am in the GSRP of the Institute of Physics.

**Outline**

I. Motivation
   1. Elementary processes in plasmas
   2. Scattering cross section

II. Formal scattering theory
   1. Elastic scattering
   2. Inelastic and reactive scattering

III. Advanced concepts
   1. Adiabatic approximation
   2. Resonance scattering
   3. Optical potential
   4. Break-up collisions

IV. Typical applications
   1. Dissociative attachment
   2. Charge exchange

**Literature:**

A multitude of books deals with scattering theory and its application to atomic and molecular collisions. My favorites at an intermediate level are:

- B. A. Bransden, Atomic collision theory (Benjamin, 1983)
- G. F. Drukarev, Collisions of electrons with atoms and molecules (Plenum Press, 1987)

A very good book devoting considerable space to semiclassical approximations which are mathematically rather charming is:

- M. S. Child, Molecular collision theory (Dover Publications, 1984)

gez. Franz X. Bronold
This introduction to the scattering theory of low energy (0.1 to 1.0 eV) atomic and molecular collisions provides a strong theoretical background, maintaining a balance between classical and quantum approaches. Addresses the four main branches of the subject—elastic, inelastic and reactive scattering, and electron excitation—all supported by computational techniques. Get A Copy. Amazon. Further, their requirements in using collision processes and employing models do not generally include the use of formal scattering theory, a large fraction of the content of many advanced texts. In fact, most researchers who work in the area of atomic and molecular collisions tend to pride themselves on their ability to describe results using simple theoretical models based on classical and semiclassical methods. Order online at springer.com or for the Americas call (toll free) 1-800-SPRINGER or email us at: customerservice@springer.com. For outside the Americas call +49 (0) 6221-345-43 A development of the atomic molecular theory from the law of multiple proportions and law of definite proportions. 

This atomic explanation looks like the definitive answer to the question of what it means to combine two elements to make a compound, and it should even permit prediction of what quantity of lead sulfide will be produced by a given amount of lead. For example, \(6.5 \: \text{g}\) of lead will produce exactly \(7.5 \: \text{g}\) of lead sulfide, \(50 \: \text{g}\) of lead will produce \(57.7 \: \text{g}\) of lead sulfide, etc.