Chapter 1 – Introduction to Statistical Consulting

- **Discuss syllabus, course and your background: one of our goals is to take our book knowledge and apply it to real problems – communication is therefore essential**
- **In this course, you'll work in groups of 3 students with a client(s) (in person, by phone and/or via email)**
- **As statistical consultants, we serve as problem solvers**
- **Symbiosis between data and theory (see examples on pp.3-4) – called the scientific method (SM):**

§1.1 History of the Scientific Method

- **Our text on p.5 (ignores Eastern philosophy of Confucius etc.) talks about challenges of Galileo, Kepler and Copernicus, and fallacy of the Greek model**
- **Sir Francis Bacon (1561-1626)**

- **Rene Descartes (1596-1650)**

"There is nothing more futile than to busy oneself with bare numbers and imaginary figures." **[Data without context have little meaning.]**	

- **The SM lead to many discoveries in the 18th – 19th – 20th centuries including the calculus in math, and the field of probability and statistics**

§1.2 The Development of Statistics

- **The roots of statistics lie in probability (Pascal and Fermat). Next came the CLT and LLNs (Quetelet), and then regression and correlation (Galton & Pearson); the controversy between Pearson and Fisher is now legendary (see e.g., Agresti's CDA books)**

Ronald A. Fisher (1890-1962)	Karl Pearson (1857-1936)

- **Empirical evidence was used to confirm Boyle's law: PV = K (relating air pressure to volume)**
- **Gosset's (1876-1937) work at Guinness Brewery in Dublin and the Student's t distribution**
- **Fisher's work at Rothamsted: ANOVA, bioassay, α = 5%**
- **In industry: QC, Control charts, TQM, QA, Deming**
- **In health sector: link between smoking and lung cancer was finally admitted by Liggett Group in 1997**
- **See summary table on p.11**

§1.3 An Overview of Statistical Consulting

- "The problem is that most researchers don't have time to acquire this specialized [statistical] knowledge along with the practical experience to apply it appropriately. There is a need to involve someone who understands the scientific process & has the quantitative skills to fulfill this important role: <u>the statistical consultant</u>."*p.11*
- Book outline is at top of p.12
- Consultants can work on teams or as advisors/consult.
- Required skills include:
  - Scientific (learn quickly; comes with practice)
  - Statistical (course work or short courses)
  - Computational (courses, seminars, on your own)
  - Communication (it's important to practice)
- Need to truly *listen*; challenging to do always and especially over email!

1.4 Statistical Consulting Environments

- Pharmaceutical (statistician tasks on p.16)
  Nonclinical discovery → Preclinical → Clinical
  -Phase I (safety, PK, healthy volunteers)
  -Phase II (target patients, MTD: max. tolerated dose)
  -Phase III (large clinical study; safety and efficacy)
  -Phase IV (post-marketing, AEs)

- **Telecommunication – as pointed out on p.17, very large databases, different types of jobs in research versus business divisions**
- **Business**
  - **Consulting companies (Smith Hanley, PPD, ICF International (Macro), etc.) – stages of work on p.19 for work in market research survey analysis**
  - **Private consultants – tough to 'juggle'**
  - **Expert witness**
- **Government – Census Bureau, Commerce, World Bank, NCHS, USAID, NIH, CDC, FDA, NIEHS, etc. http://www.bls.gov/ooh/math/statisticians.htm**
- **University**
  - **Need Consulting Center**
  - **Consulting course**