Introduction - Physics
SEAS Academic Meeting

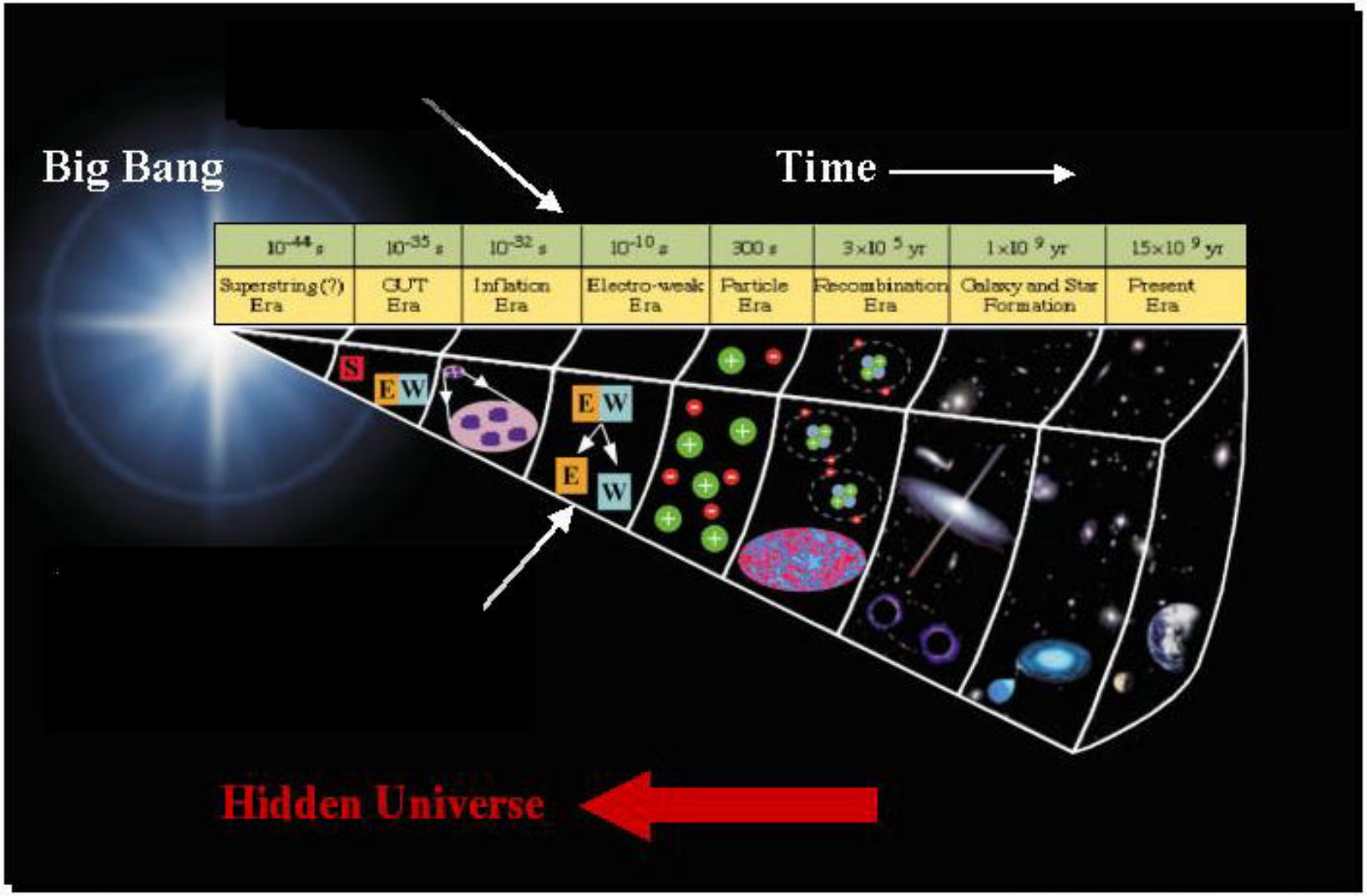
- **Intro: Frank Sciulli – Professor in the Physics Dept.**
  - **Lecturing in one of the Freshman courses**
  - **Purpose here: discuss relevant elementary physics courses**

http://www.nevis.columbia.edu/~sciulli/seas/Physics-2003.pdf

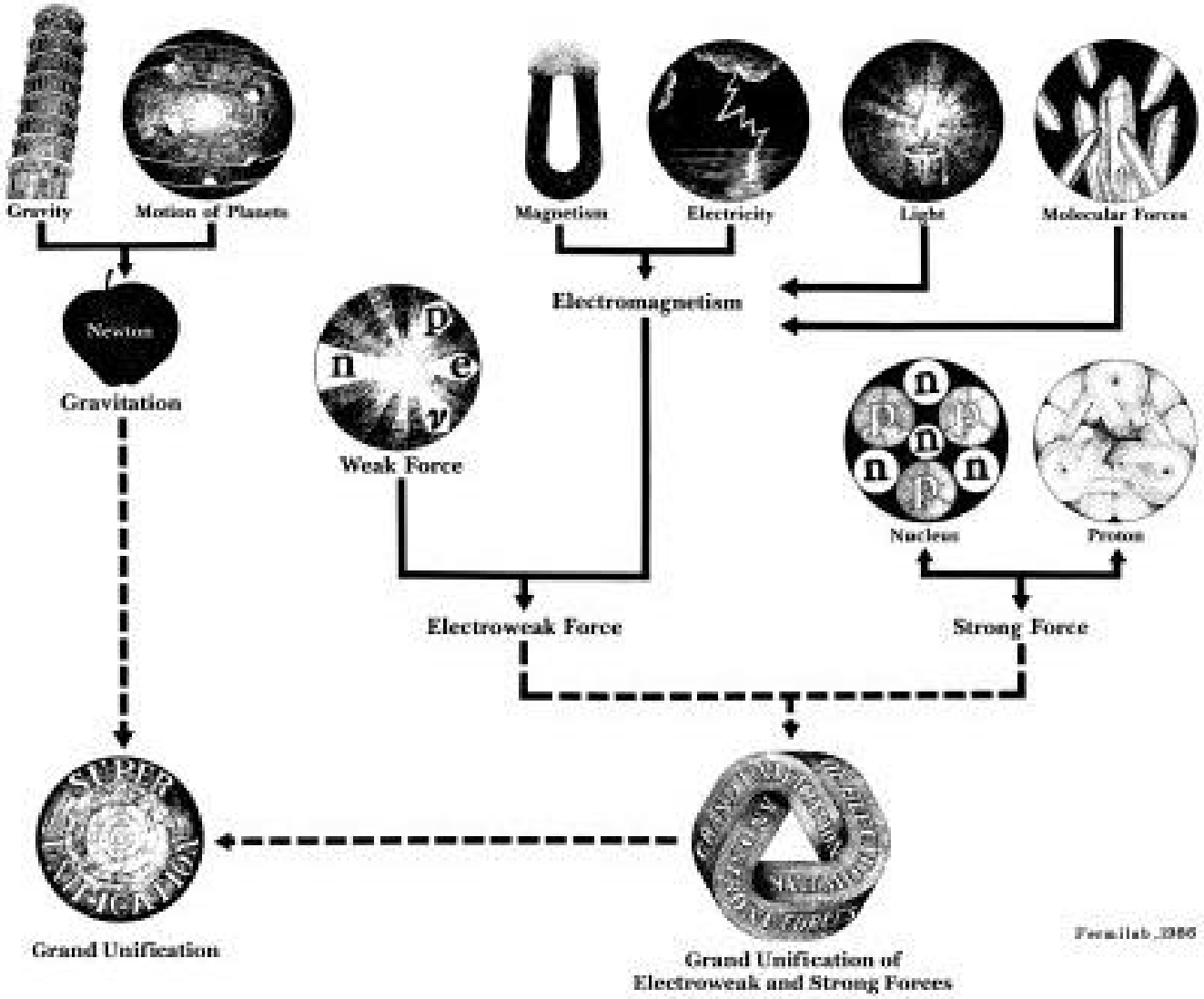
- **Everything I show can be found at this website**
- **Copy the website name and put down your pens**

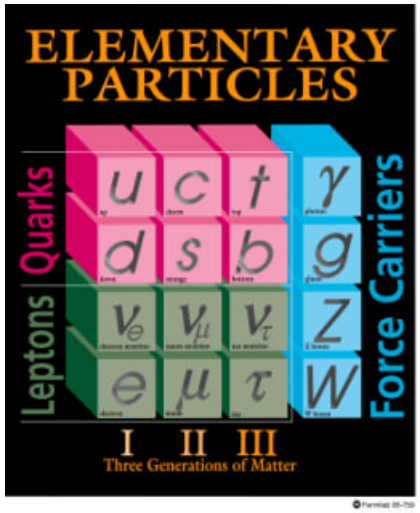
- **Today I will <u>not</u> discuss**
  - **Physics for Poets course**
  - **Physics courses primarily for pre-medical (pre-professional)**

Background


Big Bang
Time
10^{-44} s
10^{-35} s
10^{-32} s
10^{-10} s
300 s
3×10^{5} yr
1×10^{9} yr
15×10^{9} yr
Superstring (?) Era
GUT Era
Inflation Era
Electro-weak Era
Particle Era
Recombination Era
Galaxy and Star Formation
Present Era
S
E W
E W
E
W
Hidden Universe

Physics: Motion, Matter, and Forces





Physics Courses
SEAS Academic Meeting

- **Physics underlies all of science and engineering … essential to understand and be able to use**
- **Science-Engineering courses aim to integrate well with mathematics sequence …**
  - **all incorporate calculus at early stage**
- **Three different introductory sequences for people with differing preparations, interests, and goals**
  - **1400 sequence: emphasizes basics, connections in the world, and college level physics problem solving**
  - **1600 sequence: approach more mathematical and abstract; same topics covered, but order of topics slightly different**
  - **2800 sequence: the three semesters of the 1600 sequence in two semesters; specifically for students with advanced placement in mathematics and strong background in physics**

1400 Sequence

- **Three semester sequence (no labs included)**
  - **1401-Mechanics and Thermodynamics**
  - **1402-Electricity/Magnetism and Optics**
  - **1403-Wave motion and Quantum Mechanics**
- **Each is worth 3.0 points**
- **Recommended median grade at B-B$^+$ interface**
- **Some majors require only 1401-1402**
- **Separate Lab courses (when appropriate)**
  - **If 1401-02 only, take 1493 in 3rd semester**
  - **If all 3 semesters, take 1494 in 4th semester**
- **Emphasizes basics, connections in the world, and college level physics problem solving**

1600 Sequence

- **Three semester sequence (no labs included)**
  - **1601-Mechanics and Relativity**
  - **1602-Electricity/Magnetism and Thermodynamics**
  - **2601-Optics, Wave motion, and Quantum Mechanics**
- **Each is worth 3.5 points**
- **Recommended median grade at middle of B^+**
- **Some majors require only 1601-1602**
- **Separate Lab courses (when appropriate)**
  - **If 1601-02 only, take 1493 in 3rd semester**
  - **If all 3 semesters, take 2699 in 4th semester**
- **College level physics problem solving; more abstract and theoretical than 1400 sequence**

2800 Sequence

- **Two semester sequence (no labs included)**
  - **2801-Accelerated Physics I**
  - **2802-Accelerated Physics II**
  - **Includes all topics of 1601-02-03 in two semesters**
- **Each is worth 4.5 points**
- **Recommended median grade at B^+-A^- interface**
- **Permits taking 3000 level courses as sophomore**
- **Separate Lab courses (when appropriate)**
  - **3081: two research level experiments per semester**
  - **may be repeated … 13 experiments to choose from**
- **Cover 1600 sequence in two semesters; requires strong background in mathematics and in physics to enroll**

2801 Course Selection

- In order to teach so much in two semesters, only students with prior good preparation in both physics and calculus may enroll
  - Students with 5 in AP Physics and AP Calculus may automatically enroll
  - Others must take physics exam to select the best prepared ~ 40 students
- Those interested should meet with instructor today (8/26/03) at 4:00 PM
  - Professor Norman Christ
  - 301 Pupin
  - Will take about one hour

Choosing Physics Course

- **1401 has two sections in Fall**
- **One section each of 1401, 1601, and 2801 are at the same time**
  - **Permits (early) interchanging if necessary**
- **Suggestions:**
  - **Examine carefully your background, interests, and goals, in consultation with your advisor**
  - **Check out assigned texts and syllabus**
  - **Decide and enroll in the most appropriate**
  - **If you need to change, easier to change down**
  - **Changes should be made as early as possible**

Science/Engineering Sequences - Summary

Sequence	Points	Recommended Median Grade	Separate Lab Course
Physics 1401-2-3	3.0	B/B$^+$	1493 or 1494
Physics 1601-2, and 2601	3.5	mid B$^+$	1493 or 2699
Physics 2801, 2802	4.5	B$^+$/A$^-$	3081

Some Advice

- **Physics is a predictive and experimental science**
  - **You can tell if you understand it: can you do problems?**
  - **Initially, it may take some time (and effort) for concepts to 'click' and their application to problems become transparent**
- **Learning physics requires students to work: develop ability to make quantitative predictions of physical phenomena**
- **This is tested (and grades assigned) by in-class examinations involving physical problems – no multiple choice/essay questions/……**
- **Homeworks are designed primarily to prepare for the examinations**
  - **Small fraction of grade comes directly from homeworks**
- **Good grades depend on student's understanding as demonstrated by doing problems in exams**
- **Essential to develop good working habits early**
  - **Do all the homeworks on time; read ahead; stay current**
  - **Do not fall behind (because, *e.g.*, it is similar to high school). New stuff will come soon enough!**

Help Available

- **Be able to do problems**
  - **If you cannot, you do not yet understand the concepts and the relationships.**
  - **Do not feel limited to doing the assigned homework problems.**
- **If you have trouble, and lecture + text + references + website/handouts for the course are not enough**
  - **Working on homeworks with friends/colleagues is encouraged.**
  - **Homework solutions are typically available soon after they are due. Use these as study tools to check your solutions and validate your understanding.**
  - **Lecturers have regularly scheduled office hours, and sometimes email contacts (usually posted). Take advantage of these one-on-one connections when you require them.**
  - **Many courses have optional recitation sessions to go over homework problems after they are due.**
  - **Physics Dept schedules Help Room at regular hours during the week (M-F) for one-on-one help with graduate teaching assistants.**
- **When you think you understand it, go back and do the problems by yourself "cold"**
  - **+ try a few more (unassigned) problems to check.**

Finale

- **Welcome to Columbia!**
- **A great place to satisfy your interests in doing science**
  - **Understand where it comes from**
  - **See where limits of our knowledge are**
  - **Learn how to use science to solve problems**
- **Good luck on your undergraduate career !!**