

Introductory Chemistry Laboratories

HHMI provided funding that has benefited the entire lower-level chemistry laboratory curriculum. Many experiments have been significantly updated and we plan to continue in this vein.

For the organic curriculum, three different molecular modeling laboratories were designed to introduce students to the power of computers in structural analysis. Hotplates were purchased to replace steam and flame units and Mel-Temp[®] apparatus have replaced “Thiel tubes” for melting point determinations. Finally, microscale glassware allows us currently to run three semi-micro laboratory exercises.

We chose computer modeling to illustrate the following concepts using Spartan[®] as well as the ChemOffice[®] suite of programs: (a) effects of substituents on the energetics of six membered rings; (b) acid base equilibria; (c) resonance effects for conjugate bases, (d) effects of substituents on both alkene and carbocation stabilities; and (e) complex molecular frameworks (the core of taxane). During the 2006-2007 academic year, all students taking organic chemistry will complete one of the three modeling exercises each semester.

Microscale glassware is used for the Benzoin Condensation, the distillations in our “Unknown Carbonyl Compound” experiment and finally the preparation of the honey bee pheromone, isoamyl acetate (Fisher esterification). Use of semimicro procedures reduces chemical waste disposal costs as well as the dangers of storing and transporting those wastes. A final benefit is that we use smaller quantities of volatile and flammable solvents such as diethyl ether.

Mel-Temp[®] apparatus are used to measure melting points of materials in any experiment in which a solid compound is produced; at least nine different laboratories over two semesters of organic chemistry have been affected by this change. Mel-Temp[®] apparatus do not require burners to heat as Thiel tubes did, and the new apparatus are also used in a course designed specifically for chemistry majors: Chemistry 356 (Qualitative and Inorganic Laboratory Methods).

Finally, HHMI funding allowed the department to buy 42 hotplate/stirrers that are used in all four of the laboratory courses which freshmen and sophomore biology, chemistry, and pre-medical students typically take (Chemistry 151, 252, 353 and 354).

As indicated above, the apparatus, computers and software obtained through the support of the Howard Hughes Medical Institute has been invaluable in improving the safety and accuracy of our chemistry curriculum. HHMI funding has also been instrumental in modernizing several experiments and introducing the power of computers to the largely experimental science of chemistry.