T-Noon RECENT PROGRESS IN OPTICAL INDICATORS FOR CALCIUM. Roger Y. Tsien, Dept. of Physiology-Anatomy, University of California, Berkeley, CA 94720

This talk will be an informal progress report on new optical probes for measuring and manipulating cytosolic free calcium concentrations, $[Ca^{2+}]_i$. Featured will be a new subgroup of tetracarboxylate indicator dyes with major advantages over their popular but flawed predecessor, "quin2". The best of the new dyes, "fura-2" and "indo-1", are some thirty times brighter than quin2, show major shifts in wavelengths not just intensity upon binding Ca^{2+}, and can be used with glass microscope optics or lasers for flow cytometry. Minor advantages include better rejection of competing divalent cations and slightly weaker absolute affinities for Ca^{2+}. These dyes permit measurement of $[Ca^{2+}]_i$ in single cells. Surprising $[Ca^{2+}]_i$ transients are found in sea urchin embryos during the mitotic cycle. Flow cytometry of mouse lymphocytes reveals heterogeneity of $[Ca^{2+}]_i$ in response to mitogens.

Another focus will be the recent development of chelators whose affinity for Ca^{2+} is irreversibly reduced by illumination. These o-nitrobenzhydrol derivatives are the first realizations of "caged calcium". Biological applications to excitable tissues will be discussed.

Other topics that may be mentioned, depending on research progress, include the reaction kinetics of tetracarboxylate chelators with Ca^{2+}, the synthesis of fluorescent Ca^{2+} indicators with wavelengths like fluoresceins or rhodamines, and indicators for intracellular free Na^+.