# V. BIOPHYSICAL CHEMISTRY*

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## RESEARCH OBJECTIVES

In recent years, considerable effort has been expended in the elucidation of biochemical mechanisms by utilizing physical chemical techniques. This project, while we are still making use of general physical chemical techniques, is primarily concerned with kinetic studies of chemical reactions of biochemical interest. Techniques have recently been developed which permit the study of chemical reactions with half times as short as $5 \times 10^{-10}$ sec.[1] The advantage of being able to carry out kinetic studies over an extended time range is that the entire course of a chemical reaction can be observed. Since reaction intermediates are directly detected, detailed chemical mechanisms can be obtained.

In order to better understand complex biological reactions, the behavior of some simpler model systems is being investigated. This work includes studies of the interactions of metal ions with amino acids, peptides, and polymers in an effort to try and understand the role of metal ions in enzyme catalysis.[2] Also, since macromolecules are of extreme importance in biological systems, chemical processes involving simple polymers, polypeptides, proteins, and polynucleotides are being examined, particularly with regard to possible fast conformational changes.

In addition to model systems, several enzymatic systems are being studied. Fast reaction techniques have already yielded a detailed mechanism for one enzyme system[3] and results for other systems will be available soon. Also, the catalytic role of the macromolecule is being explored.

By coupling kinetic studies with known information about molecular structures, it ultimately should be possible to understand enzymatic mechanisms on a molecular basis.

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### References

1. G. G. Hammes, Quarterly Progress Report No. 65, Research Laboratory of Electronics, M.I.T., April 15, 1962, p. 5.

2. G. G. Hammes and J. I. Steinfeld, Relaxation spectra of some Ni(II) and Co(II) complexes, J. Am. Chem. Soc. (in press).

3. G. G. Hammes and P. Fasella, A kinetic study of glutamic-aspartic transaminase, J. Am. Chem. Soc. (in press).

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