

## **Synopsis:**

### **ChE 562, Special Topics in Transport Phenomena**

Fall term 2001

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No engineering project can be conceived, let alone solved, purely through use of a descriptive discipline such as transport phenomena. A problem oriented heuristic strategy is needed for this purpose, and it will normally have a hierarchical form, starting with conceptual goals and proceeding via ever more detailed studies toward a final design. The purpose of such a strategy is to limit the number of situations which must be considered, but the cost of this approach is that one is constantly working in ignorance: each decision can only be justified by analysis at the next more detailed stage of the design process.

Transport phenomena can however be immensely helpful in such a design project by providing useful guides, starting with qualitative judgments and going on through order-of-magnitude estimates and asymptotic approximations to successively more detailed predictions and suggestions for experiments until that final design is reached. Properly used these guides can speed the design or development process and decrease the inevitable uncertainties of all creative processes. Transport phenomena is thus a highly effective tool which can be incorporated into a design strategy.

The purpose of this course is to provide the experience needed to use transport phenomena. The approach will be to reverse the above procedure and to start with rigorous detailed descriptions and show how these can lead to the more general higher-level approximations needed in a design situation. Emphasis will thus be on justifying order-of-magnitude techniques, finding shape and model insensitive correlations, and describing approximation techniques found to work by successful engineers. Many useful correlations already exist, and their effectiveness will be demonstrated. However, it will also be shown that new ones can be constructed with reasonable certainty when faced with novel situations. Actual examples will be used throughout.