

Dr. John S. Olson and Dr. Susan Cates will conduct four sessions. In the first session, Dr. Olson will provide a background in **blood substitutes, oxygen transport, and hemoglobin biochemistry and biophysics**, and then give a tour of X-ray crystallography and ultra-fast laser photolysis kinetics laboratories. In the second and third sessions, Dr. Cates will provide an introduction and then practical experience in **bioinformatics** and the use of **genome and structural data bases** to answer questions in human diseases and development associated with red blood cells and hemoglobin. In the fourth session, Dr. Olson will describe how the power of modern molecular genetics, biology, biophysics and chemical engineering can be used to develop hemoglobin-based oxygen carriers for the **treatment of** hemorrhagic shock (severe blood loss) and perhaps even strokes and cardiac infarctions.

General reading on hemoglobin and molecular biology.

1. Nelson, D. L. and Cox M. M. (2005) *Lehninger Principles of Biochemistry* (4th Edition), Chapter 5 "Protein Function," pp. 157-174, W. H. Freeman and Company, New York.
The hemoglobin section in any general biochemistry or biology textbook will suffice (i.e. books by Stryer, Matthews, Voet & Voet, etc.).
2. Dickerson, R. E., and Geis, I. (1983) *Hemoglobin: Structure Function, Evolution, and Pathology*, The Benjamin Cummings Publishing Company, Menlo Park, CA.
Any all parts of this old book are very interesting, but it can only be found in libraries. It is out of print and is not required.
3. Judson, H. F., (1996) *The Eighth Day of Creation: Makers of the Revolution in Biology* (Paperback version) CSHL Press, Plainview, N.Y.
This book provides some key history to the beginning of molecular biology and the solution of the crystal structures of myoglobin and hemoglobin. It is worth buying and reading for anybody interested in the history of the revolution in modern biology but is also not crucial for my course.

Specific Reading on Blood Substitutes:

1. Underwood, A. (2002) "The Quest for Artificial Blood," Newsweek (msNBC) June 24, pp. 69-71
2. Stokstad, E. (2002) "Not blood simple," Science **295**, p. 1003.
3. Rinaldi, A. (2005) "A bloodless revolution," EMBO Reports **6**(no.8) pp. 705-708
4. Olson, J. S. and Maillett, D. H (2005) "Designing Recombinant Hemoglobin for Use as a Blood Substitute, Chapter 31 in *Blood Substitutes* (Robert Winslow, Kim D. Vandegriff, Eds.) Elsevier, London, UK, pp. 354-374. (Don't buy - it is too expensive).

Other references are given in the PowerPoint handouts, which can also be found at:

<http://www.bioc.rice.edu/~olson/courses.html>