Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Microcirculatory Dynamics at the Cellular Level ALEKSANDER S. POPEL, Johns Hopkins University — Blood is a suspension of formed elements that occupy 40% of the volume; the formed elements are red blood cells (RBC), white blood cells or leukocytes, and platelets. Microcirculation refers to the flow of blood and associated transport processes in the network of vessels with diameters 5 to 100 microns. In these vessels, the ratio of the vessel diameter to the characteristic RBC diameter ranges between approximately one and ten, which precludes using a continuum description of blood and necessitates consideration of the discrete nature of the suspension. The blood vessels are lined with endothelial cells that determine RBC, leukocyte and platelet interactions with the vascular wall. The mechanics of the interactions between cells and with the endothelium are governed by complex physico-chemical processes, e.g., RBC and platelet aggregation, receptor-mediated leukocyte adhesion to the endothelium, and interactions of circulating cells with the endothelial glycocalyx, a network of polysaccharides that project from the endothelial luminal surface. Significant advances have been made in elucidating the nature of these interactions, but a general theory of blood flow in microvessels has been beyond reach. A brief overview of the achievements of the theoretical and numerical studies on the subject will be presented and unresolved problems will be discussed.

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Date submitted: 28 Jul 2005 Electronic form version 1.4