

**P015** The ribosome as an entropy trap  
**Beringer Malte**<sup>1</sup>; **Sievers Annette**<sup>2</sup>; **Wolfenden Richard**<sup>2</sup>;  
**Rodnina Marina V.**<sup>1</sup>

*<sup>1</sup>Institute of Physical Biochemistry, University of Witten/Herdecke, Germany and <sup>2</sup>Department of Biochemistry and Biophysics, University of North Carolina, Chapel Hill, NC 27599*

To determine the effectiveness of the ribosome as a catalyst, we examined the rate of peptidyl transfer by the ribosome and the rate of uncatalyzed peptide bond formation. Peptidyl transfer on the ribosome was measured by the reaction of dipeptidyl-tRNA with puromycin, uncatalyzed peptide bond formation was measured by the reaction of the ethylene glycol ester of N-formylglycine with tris(hydroxymethyl). Activation parameters were determined for both reactions from the temperature dependence of their second-order rate constants. The  $3.5 \times 10^6$ -fold rate enhancement produced by the ribosome is achieved by a major lowering of the entropy of activation. The enthalpy of activation is slightly less favorable on the ribosome than in solution. These results are consistent with the view that the ribosome enhances the rate of peptide bond formation mainly by positioning the substrates and/or water exclusion within the active site, rather than by chemical catalysis.