

The role of r-protein L31 in the bacterial ribosome

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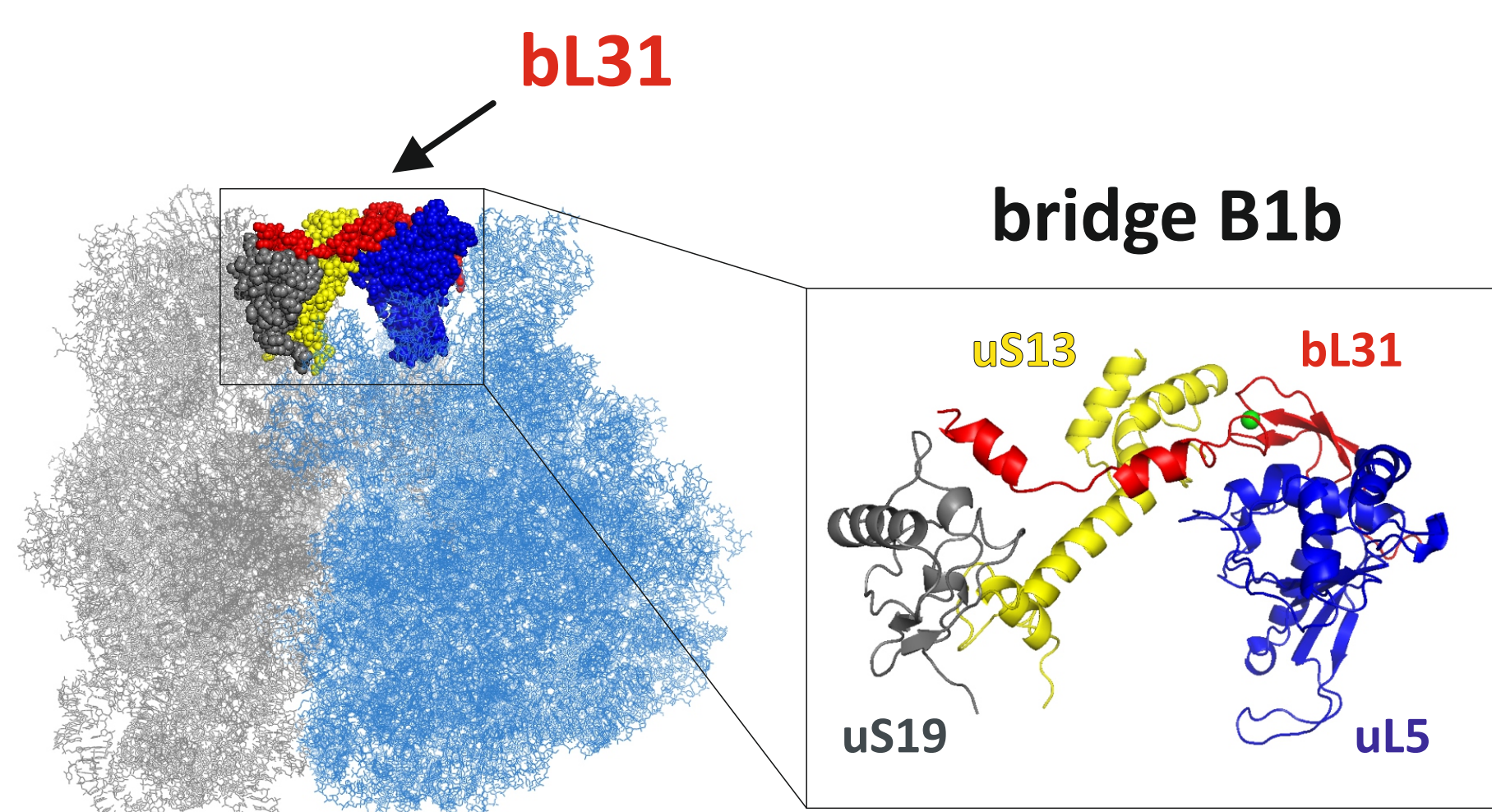
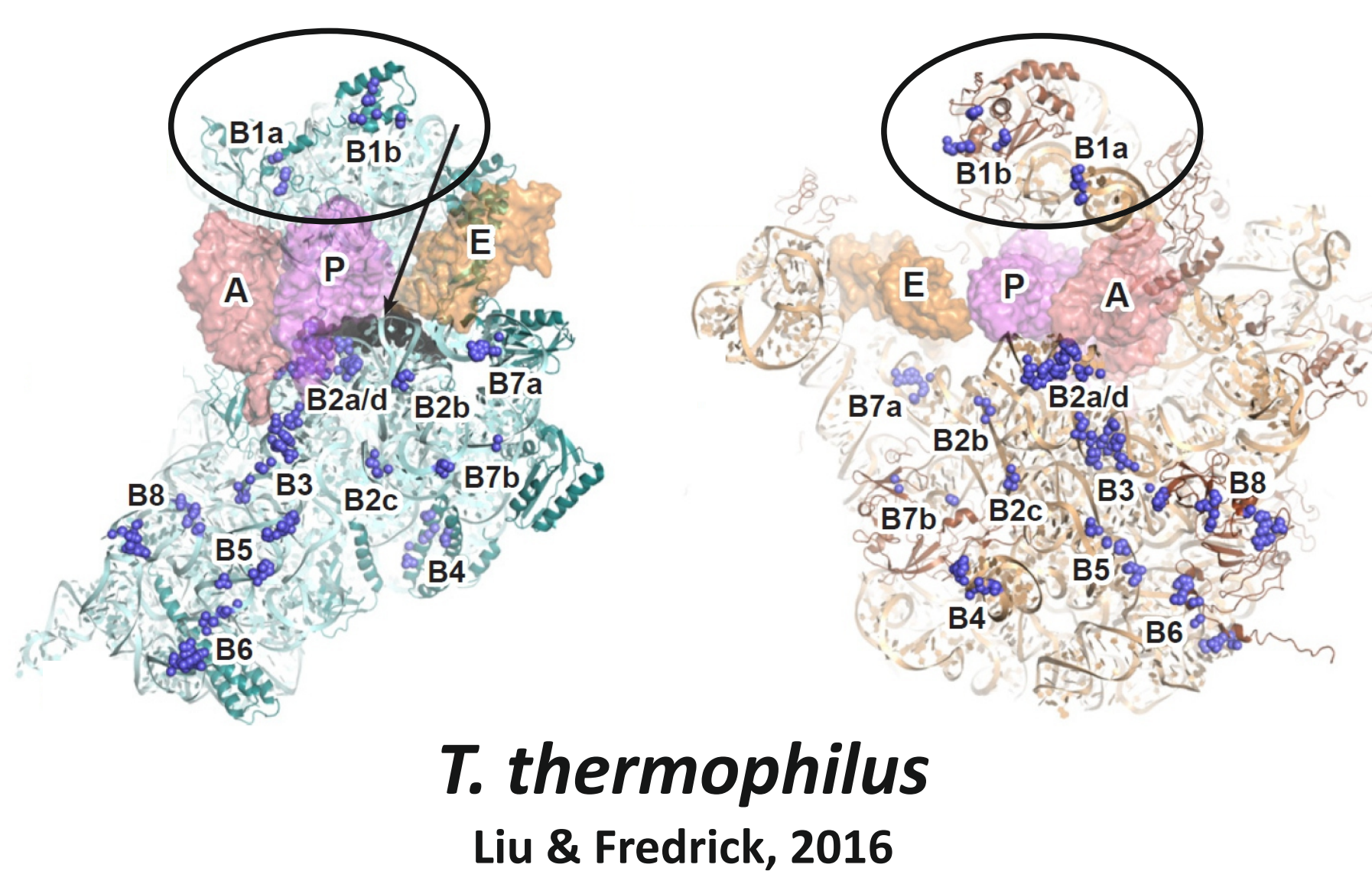
INTRODUCTION

Intersubunit bridge B1b

- one of the 12 intersubunit bridges in bacterial ribosome
- joins the head domain of 30S subunit and the central protuberance of the 50S subunit (in addition to bridge B1a)
- the only protein-protein bridge, composed of uS13, uS19 from the 30S subunit and uL5, bL31 from the 50S subunit
- the most dynamic bridge during translation (Zhang *et al.*, 2009)

Ribosomal protein bL31

- bacteria-specific and widely conserved ribosomal protein among the 995 completely sequenced bacterial genomes (Yutin *et al.*, 2012)
- positioned into the central protuberance (CP) of 50S subunit (Selmer *et al.*, 2006)
- duplicated genes in many bacterial species
- in *E. coli*, bL31 paralogs (<10 kDa) are 35,6% identical in sequence

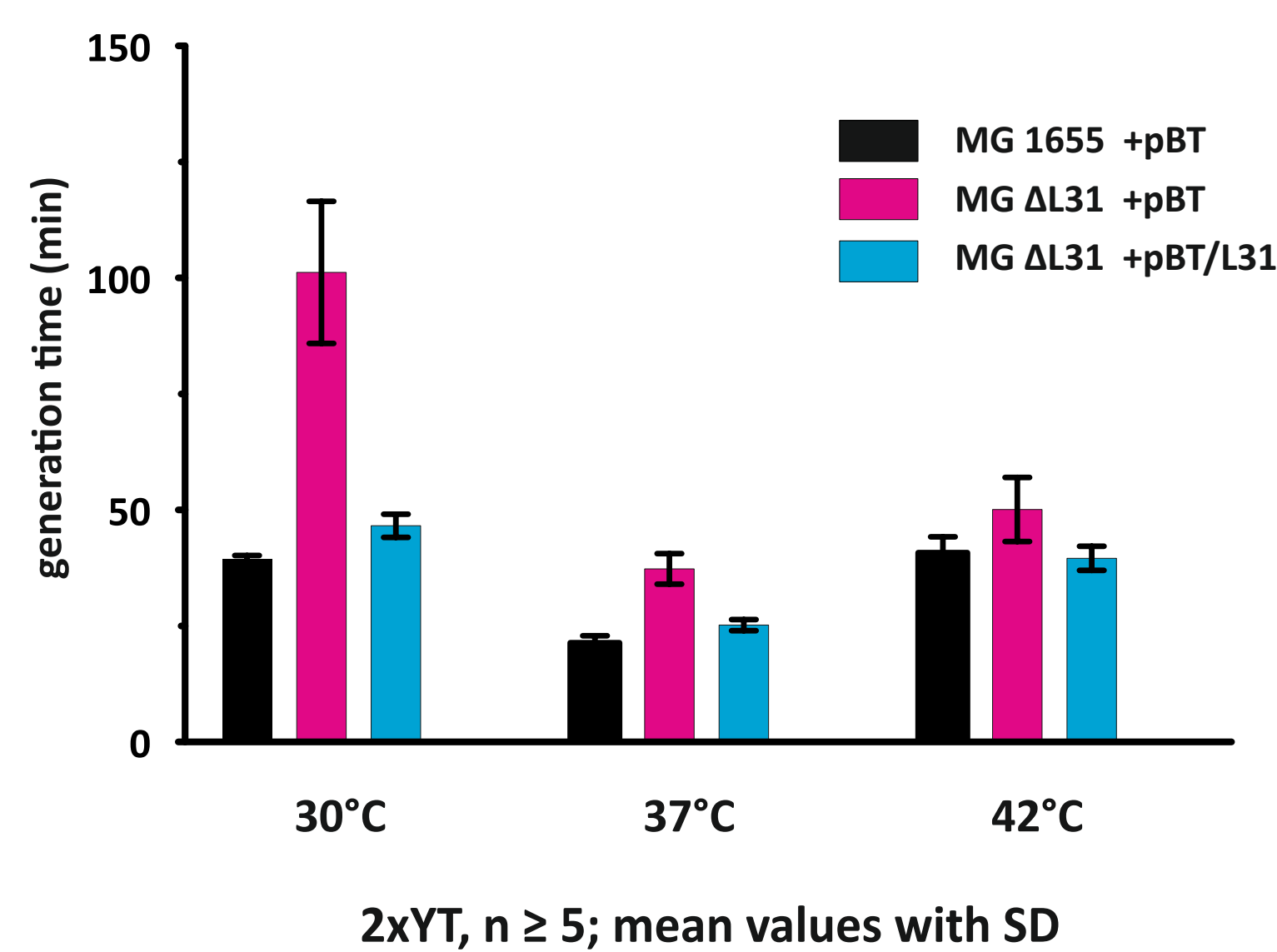


The aim of this study to elucidate the biological role of bacterial r-protein L31 in translation

Speculation protein-protein bridge B1b is involved in maintaining translational reading frame by controlling the extent of the head swivelling of the 30S subunit

RESULTS

bL31 contributes to optimal growth

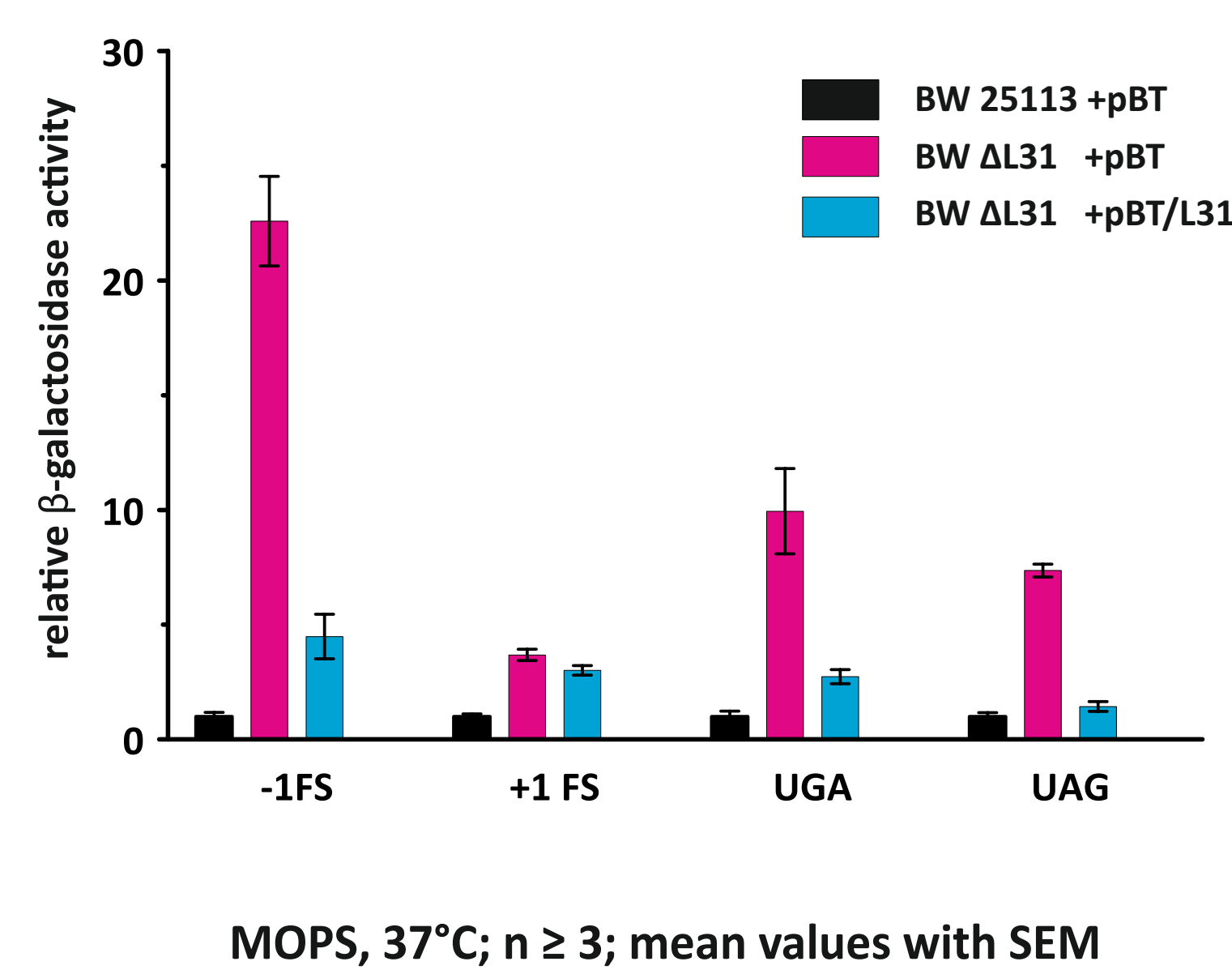


Conclusions

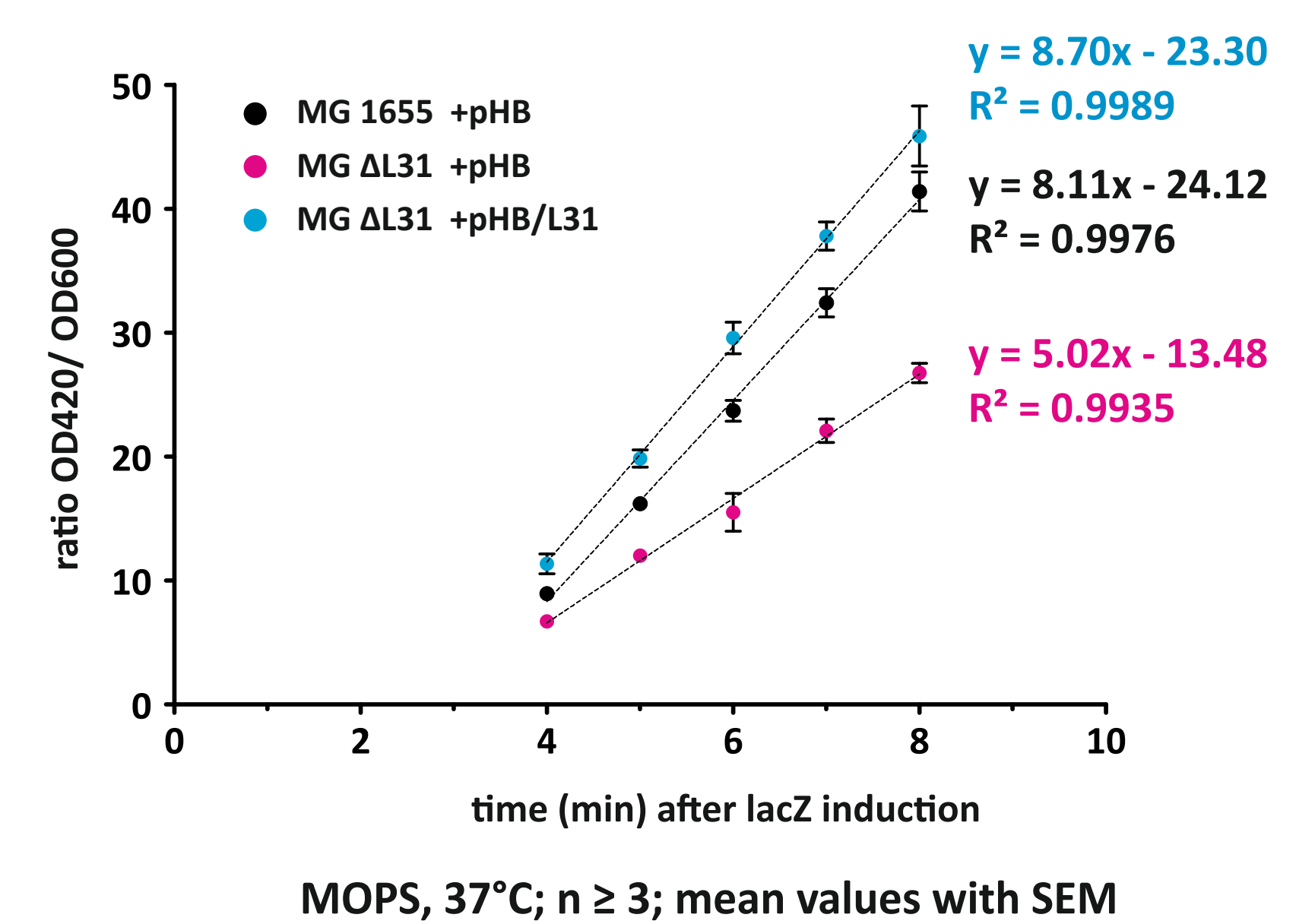
Ribosomal intersubunit bridge B1b

- is important for subunit association *in vivo* and *in vitro*
- facilitates translation initiation by yet unidentified mechanism
- contributes to translational fidelity

Loss of bL31 reduces translational fidelity *in vivo* Loss of bL31 reduces the rate of translation initiation *in vivo*

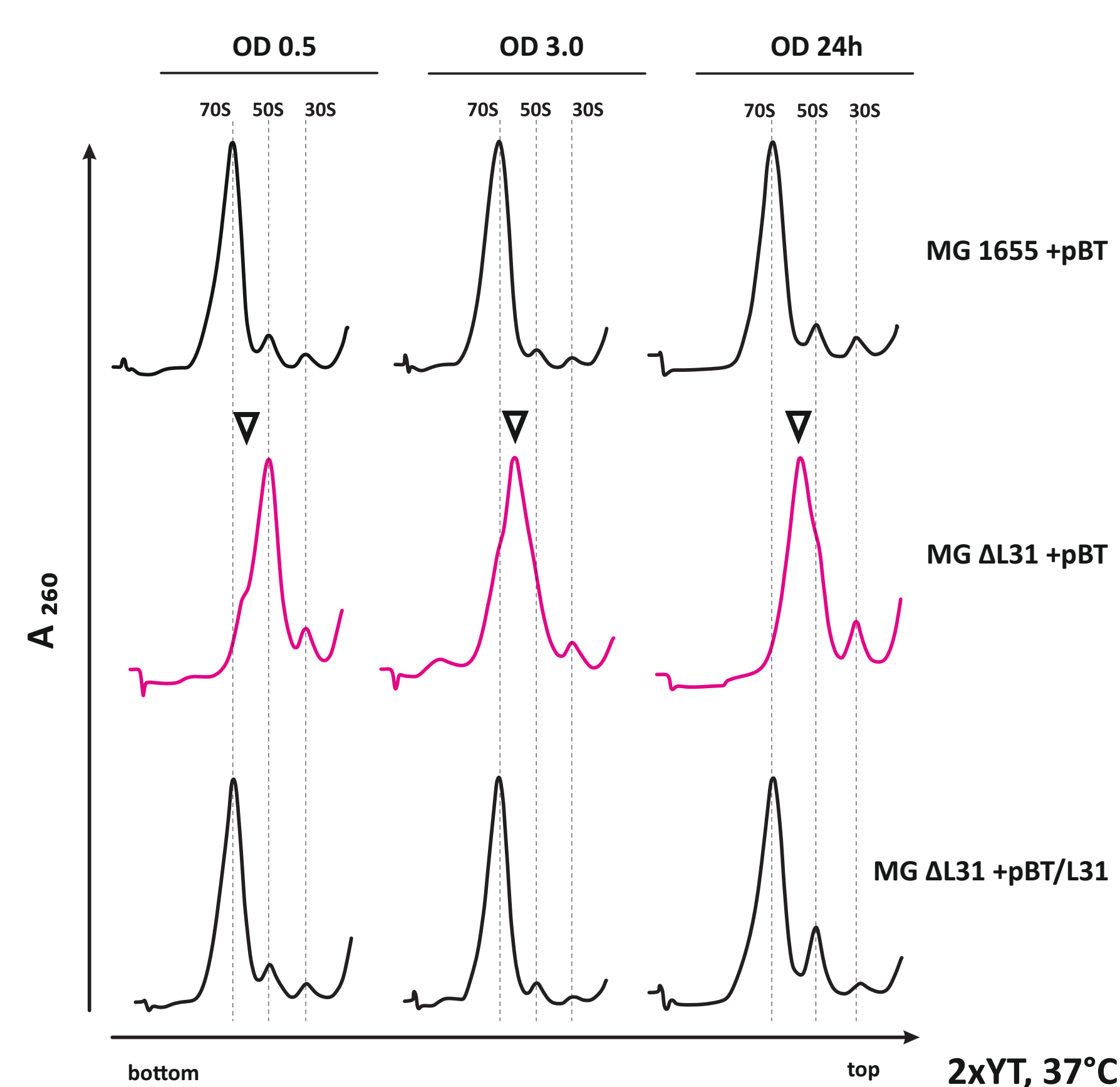


bL31-deficient ribosomes display increased -1 frameshifting and nonsense suppression as demonstrated by β-galactosidase assay.



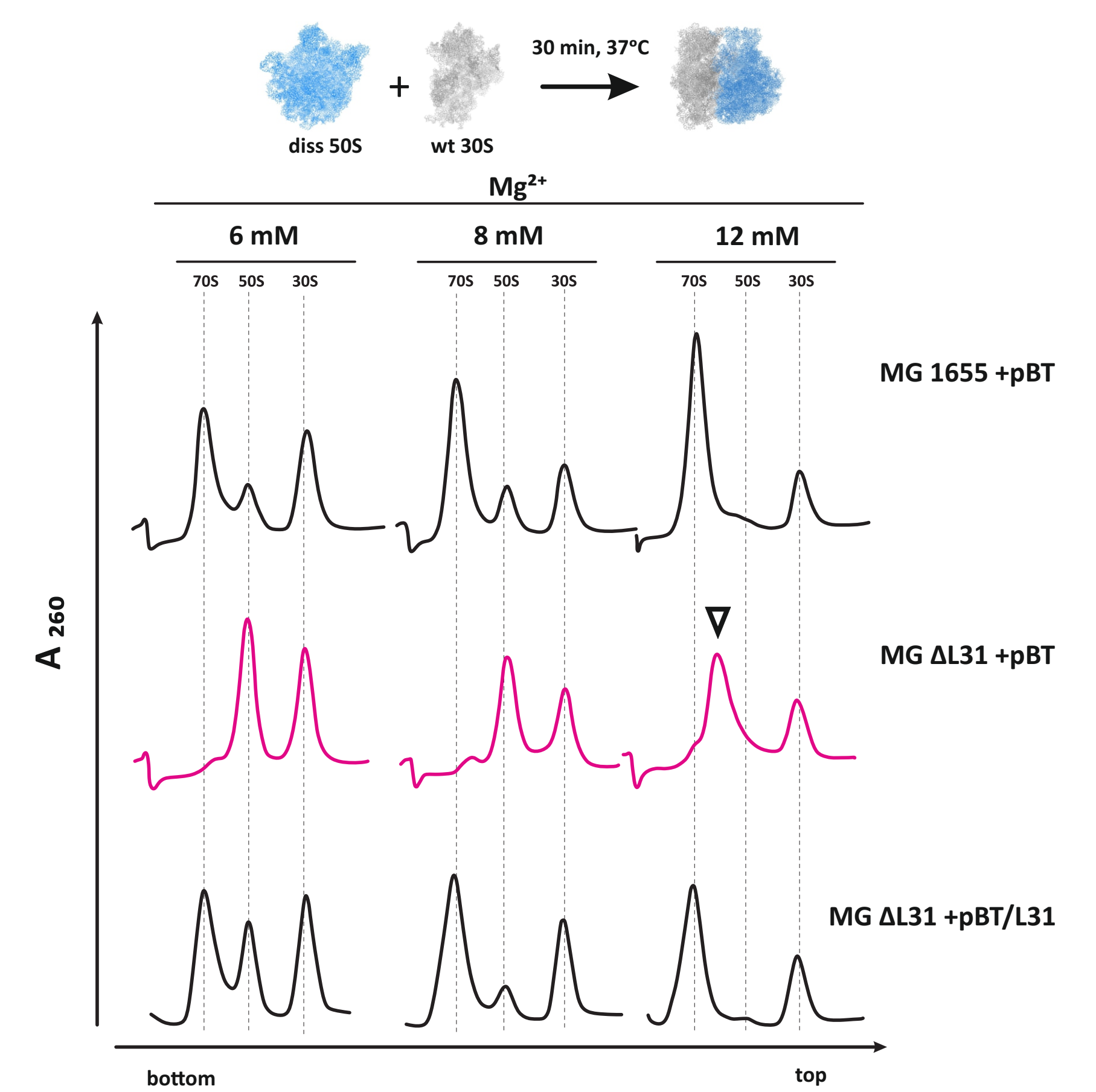
Ribosomes lacking bL31 exhibit about 1/3 slower translation initiation as demonstrated by β-galactosidase time course assay. However, the rate of elongation is not affected.

The effect of bL31 on subunit association *in vivo*



Ribosome profiles indicate that the deletion of bL31 results in the decrease of 70S particle fraction

bL31 is important for subunit reassociation *in vitro*



Large subunits without bL31 are severely compromised in subunit reassociation *in vitro*.