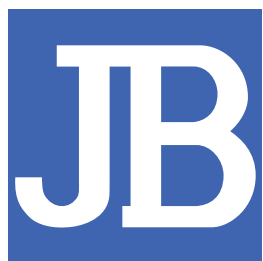


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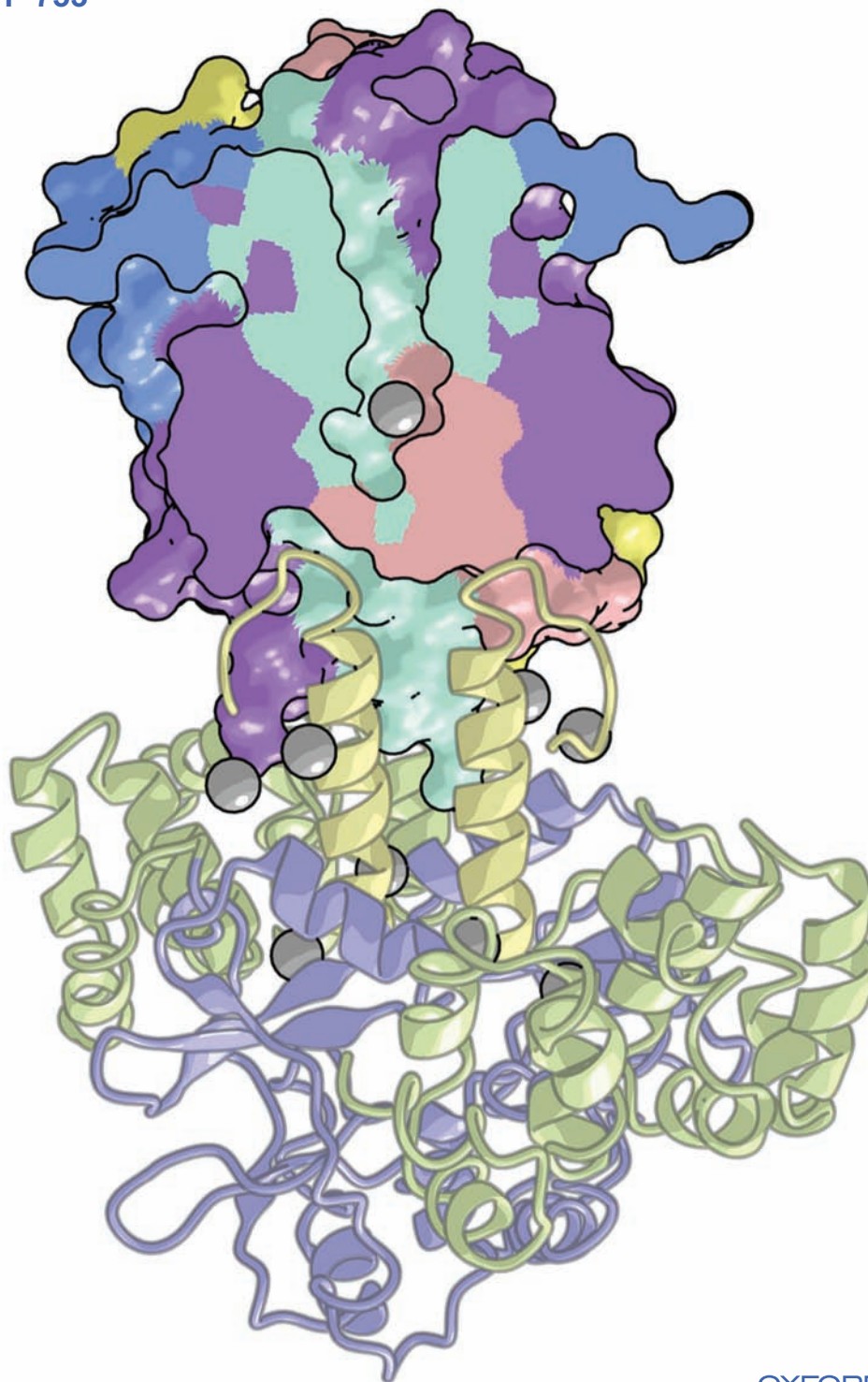


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- Protein Synthesis
- DNA-Protein Interaction
- RNA Processing
- Genetic Engineering
- Genetic Diseases
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COVER:

Discovery in Japan

Crystal structure of novel magnesium transporter, MgtE

Regulation of intracellular Mg^{2+} concentration is crucial for cellular homeostasis. Dr. Nureki and his colleagues solved the crystal structures of MgtE membrane channel in the full-length at 2.9 Å resolution (The cover figure illustrates the closed conformation), and of the cytosolic domain in the presence and absence of Mg^{2+} at 2.3 Å and 3.9 Å resolutions, respectively (1). A solvent-accessible pore nearly traverses the transmembrane domains, with one Mg^{2+} bound to the conserved Asp432 within the pore. Twelve Mg^{2+} ions are bound to the cytosolic domain acting as the Mg^{2+} sensor, which locks the closed conformation of the pore (2). On the other hand, release of the regulatory Mg^{2+} ions induces the open conformation of MgtE, which allows Mg^{2+} import into the cell (3). Thus MgtE functions in the Mg^{2+} homeostasis, in which Mg^{2+} bound cytosolic sensor domain regulates Mg^{2+} flux by sensing the intracellular Mg^{2+} concentration.

References

1. Hattori, M., Tanaka, Y., Fukai, S., Ishitani, R., and Nureki, O. (2007) Crystal structure of the MgtE Mg^{2+} transporter. *Nature* **448**, 1072–1075.
2. Hattori, M., Iwase, N., Furuya, N., Tanaka, Y., Tsukazaki, T., Ishitani, R., Maguire, M. E., Ito, K., Maturana, A., and Nureki, O. (2009) Mg^{2+} -dependent gating of bacterial MgtE channel underlies Mg^{2+} homeostasis. *EMBO J.* **28**, 3602–3612.
3. Ishitani, R., Sugita, Y., Dohmae, N., Furuya, N., Hattori, M., and Nureki, O. (2008) Mg^{2+} -sensing mechanism of Mg^{2+} transporter MgtE probed by molecular dynamics study. *Proc. Natl. Acad. USA* **105**, 15393–15398.