

References

- 4, C. C. P. N. (1994). "The CCP4 suite: Programs for Protein Crystallography." Acta Crystallographica **D50**: 760-763.
- Abrahams, J. P. and A. G. W. Leslie (1996). "Methods used in the structure determination of bovine mitochondrial F1 ATPase." Acta Cryst. **D52**: 30-42.
- Agafonov, D. E., V. A. Kolb, et al. (1999). "A protein residing at the subunit interface of the bacterial ribosome." Proc. Natl. Acad. Sci. U.S.A. **96**(22): 12345-9.
- Agafonov, D. E., V. A. Kolb, et al. (2001). "Ribosome-associated protein that inhibits translation at the aminoacyl-tRNA binding stage." EMBO Rep. **2**(5): 399-402.
- Agrawal, R. K., A. B. Heagle, et al. (1999). "EF-G-dependent GTP hydrolysis induces translocation accompanied by large conformational changes in the 70S ribosome." Nat. Struct. Biol. **6**(7): 643-7.
- Agrawal, R. K., P. Penczek, et al. (1999). "Effect of buffer conditions on the position of tRNA on the 70 S ribosome as visualized by cryoelectron microscopy." J. Biol. Chem. **274**(13): 8723-9.
- Agrawal, R. K., P. Penczek, et al. (1998). "Visualization of elongation factor G on the Escherichia coli 70S ribosome: the mechanism of translocation." Proc. Natl. Acad. Sci. U.S.A. **95**(11): 6134-8.
- Agrawal, R. K., M. R. Sharma, et al. (2004). "Visualization of ribosome-recycling factor on the Escherichia coli 70S ribosome: functional implications." Proc Natl Acad Sci U S A **101**(24): 8900-5.
- Arkov, A. L., D. V. Freistoffer, et al. (1998). "Mutations in RNAs of both ribosomal subunits cause defects in translation termination." Embo J **17**(5): 1507-14.
- Ban, N., B. Freeborn, et al. (1998). "A 9 A resolution X-ray crystallographic map of the large ribosomal subunit." Cell **93**(7): 1105-15.
- Ban, N., P. Nissen, et al. (1999). "Placement of protein and RNA structures into a 5 A-resolution map of the 50S ribosomal subunit [In Process Citation]." Nature **400**(6747): 841-7.
- Ban, N., P. Nissen, et al. (2000). "The complete atomic structure of the large ribosomal subunit at 2.4 A resolution." Science **289**(5481): 905-20.
- Barta, A., G. Steiner, et al. (1984). "Identification of a site on 23S rRNA located at the peptidyl transferase center." Proc Natl Acad Sci U S A **81**: 3607.
- Bashan, A., I. Agmon, et al. (2001). Cold Spring Harbor Symp. Qunat Biol. **64**: 43-56.
- Bayfield, M. A., J. Thompson, et al. (2004). "The A2453-C2499 wobble base pair in Escherichia coli 23S ribosomal RNA is responsible for pH sensitivity of the peptidyltransferase active site conformation
Peptide bond formation is all about proximity." Nucleic Acids Res **32**(18): 5512-8.
- Berchtold, H., L. Reshetnikova, et al. (1993). "Crystal structure of active

- elongation factor Tu reveals major domain rearrangements [published erratum appears in *Nature* 1993 Sep 23;365(6444):368]." *Nature* **365**(6442): 126-32.
- Bergemann, K. and K. H. Nierhaus (1983). *J Biol Chem* **258**: 15105-15113.
- Berisio, R., J. Harms, et al. (2003). "Structural insight into the antibiotic action of telithromycin against resistant mutants." *J Bacteriol* **185**(14): 4276-9.
- Bowman, C. M., J. E. Dahlberg, et al. (1971). "Specific inactivation of 16S ribosomal RNA induced by colicin E3 in vivo." *Proc Natl Acad Sci U S A* **68**: 964-968.
- Brandi, A., P. Pietroni, et al. (1996). "Post-transcriptional regulation of CspA expression in *E. coli*." *Mol. Microbiol.* **19**: 231-240.
- Bretscher, M. S. (1968). "Translocation in protein synthesis: a hybrid structure model." *Nature* **218**: 675-677.
- Brock, S., K. Szkaradkiewicz, et al. (1998). "Initiation factors of protein biosynthesis in bacteria and their structural relationship to elongation and termination factors." *Mol. Microbiol.* **29**(2): 409-17.
- Brodersen, D. E., W. M. Clemons, Jr., et al. (2000). "The structural basis for the action of the antibiotics tetracycline, pactamycin, and hygromycin B on the 30S ribosomal subunit." *Cell* **103**(7): 1143-54.
- Broeze, R. J., C. J. Solomon, et al. (1978). "Effects of low temperature on *in vivo* and *in vitro* protein synthesis in *Escherichia coli* and *Pseudomonas fluorescens*." *J. Bacteriol.* **134**(3): 861-74.
- Brünger, A. T., P. D. Adams, et al. (1998). "Crystallography & NMR system: A new software suite for macromolecular structure determination." *Acta Crystallogr. D Biol. Crystallogr.* **54**(Pt 5): 905-21.
- Canonaco, M. A., R. A. Calogero, et al. (1986). "Mechanism of translational initiation in prokaryotes. Evidence for a direct effect of IF2 on the activity of the 30 S ribosomal subunit." *FEBS Lett* **207**(2): 198-204.
- Carter, A. P., W. M. Clemons, Jr., et al. (2001). "Crystal structure of an initiation factor bound to the 30S ribosomal subunit." *Science* **291**(5503): 498-501.
- Carter, A. P., W. M. C. Jr, et al. (2000). "Functional insights from the structure of the 30S ribosomal subunit and its interactions with antibiotics." *Nature* **407**: 340-348.
- Cate, J. H. and J. A. Doudna (1996). "Metal-binding sites in the major groove of a large ribozyme domain." *Structure* **4**(10): 1221-9.
- Cate, J. H., A. R. Gooding, et al. (1996). "Crystal structure of a group I ribozyme domain: principles of RNA packing." *Science* **273**(5282): 1678-85.
- Cate, J. H., M. M. Yusupov, et al. (1999). "X-ray crystal structures of 70S ribosome functional complexes." *Science* **285**: 2095-2104.
- Cavicchioli, R., T. Thomas, et al. (2000). "Cold stress response in Archaea." *Extremophiles* **4**: 321-331.
- Chin, K., C. S. Shean, et al. (1993). "Resistance of lambda cl translation to antibiotics that inhibit translation initiation." *J Bacteriol* **175**: 7471-7473.
- Clemons, W. M., Jr., J. L. May, et al. (1999). "Structure of a bacterial 30S ribosomal subunit at 5.5 Å resolution [In Process Citation]." *Nature* **400**(6747): 833-40.

- Craig, E. A. (1985). "The heat shock response." CRC Crit Rev Biochem **18**: 239-280.
- Dahlberg, A. E. (1979). "A gel electrophoretic separation of bacterial ribosomal subunits with and without protein S1." Methods Enzymol **59**: 397-401.
- Dallas, A. and H. F. Noller (2001). "Interaction of translation initiation factor 3 with the 30S ribosomal subunit." Mol. Cell **8**(4): 855-64.
- Davies, J. E., W. Gilbert, et al. (1964). "Streptomycin suppression, and the code." Proc Natl Acad Sci U S A **51**: 883-890.
- Day, J. M. (2004). "Isolation of Streptomyces lividans ribosomes and initiation factors and their characterization using in vitro mRNA binding assays." Thesis.
- Delano, W. L. (2002). The PyMOL User's Manual. San Carlos, CA, USA., Delano Scientific.
- Dottavio-Martin, D., D. P. Suttle, et al. (1979). "The effects of initiation factors IF-1 and IF-3 on the dissociation of Escherichia coli 70 S ribosomes." FEBS Lett **97**(1): 105-10.
- Draper, D. E. and P. H. von Hippel (1978). "Nucleic acid binding properties of Escherichia coli ribosomal protein S1. I. Structure and interactions of binding site I." J Mol Biol **122**(3): 321-38.
- Frank, J. and R. K. Agrawal (2000). "A ratchet-like inter-subunit reorganization of the ribosome during translocation." Nature **406**(6793): 318-22.
- Frank, J., J. Zhu, et al. (1995). "A model of protein synthesis based on cryo-electron microscopy of the E. coli ribosome." Nature **376**(6539): 441-4.
- Fujita, J. (1999). "Cold shock response in mamalian cells." J. Mol. Microbiol. Biotechnol. **1**: 243-255.
- Gesteland, R. F. (1966). "Unfolding of E. coli Ribosomes by removal of Magnesium." J. Mol. Biol. **18**: 356-371.
- Giuliodori, A. M., A. Brandi, et al. (2004). "Preferential translation of cold-shock mRNAs during cold adaptation." RNA **10**(2): 265-76.
- Goldenberg, D., I. Azar, et al. (1997). "Role of E. coli cspA promoter sequences and adaptation of translational apparatus in the cold shock response." Mol. Gen. Genet. **256**: 282-290.
- Gomez-Lorenzo, M. G., C. M. Spahn, et al. (2000). "Three dimensional cryo-electron microscopy localization of EF2 in the Saccharomyces cerevisiae 80S ribosome at 17.5A resolution." Embo J **19**: 2710-2718.
- Grabowski, P. J. and A. E. Dahlberg (1990). "Gel electrophoresis of ribonuceoproteins." Electrophoresis of Nucleic Acids: A practical approach: 275-289.
- Graumann, P. L. and M. A. Marahiel (1994). "Cold shock response in Bacillus subtilis." J. Mol. Microbiol. Biotechnol. **1**: 203-209.
- Graumann, P. L., K. Schroeder, et al. (1996). "Cold shock stress-induced proteins in Bacillus subtilis." J. Bacteriol. **178**: 4611-4619.
- Grentzmann, G., P. J. Kelly, et al. (1998). "Release factor RF-3 GTPase activity acts in disassembly of the ribosome termination complex." Rna **4**(8): 973-83.
- Grunberg-Manago, M., P. Dessen, et al. (1975). "Light-scattering studies

- showing the effect of initiation factors on the reversible dissociation of Escherichia coli ribosomes." J Mol Biol **94**(3): 461-78.
- Gualerzi, C. O., L. Brandi, et al. (2000). "Translation initiation in Bacteria." The Ribosome: Structure, Function, Antibiotics and Cellular Interactions: 477-494.
- Gualerzi, C. O., A. M. Giuliodori, et al. (2003). "Transcriptional and post-transcriptional control of cold-shock genes." J. Mol. Biol. **331**(3): 527-39.
- Gualerzi, C. O. and C. L. Pon (1990). "Initiation of mRNA translation in prokaryotes." Biochemistry **29**(25): 5881-9.
- Guerrier-Takada, C., K. Gardiner, et al. (1983). "The RNA Moiety of Ribonuclease P is the catalytic subunit of the enzyme." Cell **35**: 849-857.
- Gutell, R. R.
- Guy, C. (1999). "Molecular responses of plants to cold shock and cold acclimation." J. Mol. Microbiol. Biotechnol. **1**: 231-242.
- Hansen, J. L., J. A. Ippolito, et al. (2002). "The structures of four macrolide antibiotics bound to the large ribosomal subunit." Mol Cell **10**(1): 117-28.
- Harms, J., F. Schluenzen, et al. (2001). "High resolution structure of the large ribosomal subunit from a mesophilic eubacterium." Cell **107**(5): 679-88.
- Hill, W. E. (1990). "The Ribosome: Structure, Function and Evolution."
- Hirashima, A., G. Childs, et al. (1973). "Differential inhibitory effects of antibiotics on the biosynthesis of envelope proteins of E. coli." J. Mol. Biol. **79**: 373-389.
- Hirashima, A. and A. Kaji (1972). "Factor-dependent release of ribosomes from mRNA. Requirements for 2 heat-stable factors." J. Mol. Biol. **65**: 43-58.
- Hope, H., F. Frolow, et al. (1989). "Crystallography of ribosomal particles." Acta Crystallogr D Biol Crystallogr **B45**: 190-199.
- Inouye, M. and S. Phadtare (2004). "Cold shock response and adaptation at near-freezing temperature in microorganisms." Sci STKE **2004**(237): pe26.
- Ishigami, J., Y. Fukuda, et al. (1967). "Clinical use of Kasugamycin for urinary tract infections due to Pseudomonas aeruginosa." J Antibiot **20**(2): 83-84.
- Ishitsuka, H., Y. Kuriki, et al. (1970). "Release of transfer ribonucleic acid from ribosomes. A G factor and guanosine-triphosphate-dependent reaction." J. Biol. Chem. **245**: 3346-3351.
- Janosi, L., H. Hara, et al. (1996). "Ribosome recycling by ribosome recycling factor (RRF) an important but overlooked step of protein synthesis." Advan. Biophys. **32**: 121-201.
- Janosi, L., I. Shimizu, et al. (1994). "Ribosome recycling factor (Ribosome releasing factor) is essential for bacterial growth." Proc Natl Acad Sci U S A **91**: 4249-4253.
- Jelenc, P. C. and C. G. Kurland (1979). "Nucleoside triphosphate regeneration decreases the frequency of translation errors." Proc. Natl. Acad. Sci. U.S.A. **76**(7): 3174-8.
- Jiang, W., Y. Hou, et al. (1997). "CspA, the major cold-shock protein of E. coli, is an RNA chaperone." J. Biol. Chem. **272**: 196-202.
- Jones, P. G. and M. Inouye (1996). "RbfA, a 30S ribosomal binding factor, is a

- cold-shock protein whose absence triggers the cold-shock response." Mol. Microbiol. **21**: 1207-1218.
- Jones, P. G., M. Mitta, et al. (1996). "Cold shock induces a major ribosomal-associated protein that unwinds double-stranded RNA in *E. coli*." Proc Natl Acad Sci U S A **93**: 76-80.
- Jones, P. G., R. A. VanBogelen, et al. (1987). "Induction of proteins in response to low temperature in *E. coli*." J. Bacteriol. **169**: 2092-2095.
- Jones, T. A., J. Y. Zou, et al. (1991). "Improved methods for building protein models in electron density maps and the location of errors in these models." Acta Crystallogr. A **47**: 110-9.
- Kaji, A., M. C. Kiel, et al. (2001). "The fourth step of protein synthesis: Dissassembly of the posttermination complex is catalyzed by elongation factor G and ribosome recycling factor, a near perfect mimic of tRNA." Cold Spring Harb Symp Quant Biol **66**: 515-529.
- Karimi, R., M. Pavlov, et al. (1999). "Novel roles for classical factors at the interface between translation termination and initiation." Mol. Cell **3**: 601-609.
- Karimi, R., M. Y. Pavlov, et al. (1998). "Initiation factors IF1 and IF2 synergistically remove peptidyl-tRNAs with short polypeptides from the P-site of translating *Escherichia coli* ribosomes." J Mol Biol **281**(2): 241-52.
- Kaziro, Y. (1978). "The role of guanosine-5'-triphosphate in polypeptide chain elongation." Biochim. Biophys. Acta **505**: 95-127.
- Kiel, M. C., V. S. Raj, et al. (2003). "Release of ribosome-bound ribosome recycling factor by elongation factor G." J Biol Chem **278**(48): 48041-50.
- Kim, K. K., K. Min, et al. (2000). "Crystal structure of the ribosome recycling factor from *E. coli*." Embo J **19**: 2362-2370.
- Kjeldgaard, M., P. Nissen, et al. (1993). "The crystal structure of elongation factor EF-Tu from *Thermus aquaticus* in the GTP conformation." Structure **1**(1): 35-50.
- Klein, B. K., P. Forman, et al. (1984). "Electron microscopy of secondary structure in partially denatured *Escherichia coli* 16S rRNA and 30S subunits." Biochemistry **23**(17): 3927-33.
- Klein, D. J., P. B. Moore, et al. (2004). "The contribution of metal ions to the structural stability of the large ribosomal subunit." RNA **10**: 1366-1379.
- Klein, W., M. H. W. Weber, et al. (1999). "Cold shock response of *Bacillus subtilis*: isoleucine-dependent switch in the fatty acid branching pattern of membrane adaptation to low temperatures." J. Bacteriol. **181**: 5341-5349.
- Kleywegt, G. J. and R. J. Read (1997). "Not your average density." Structure **5**(12): 1557-69.
- Kolter, R., D. A. Siegele, et al. (1993). "The stationary phase of the bacterial life cycle." Annu Rev Microbiol **47**: 855-74.
- Konisky, J. and M. Nomura (1967). "Interaction of colicins with bacterial cells. II. Specific alteration of *E. coli* ribosomes induced by colicin E3 in vivo." J. Mol. Biol. **26**: 181-195.
- Kozak, M. and D. Nathans (1972). "Differential inhibition of coliphage MS2 protein synthesis by ribosome-directed antibiotics." J. Mol. Biol. **70**: 41-55.

- Kruger, K., P. J. Grabowski, et al. (1982). "Self-Splicing RNA: Autoexcision and Autocyclization of the Ribosomal RNA Intervening Sequence of Tetrahymena." Cell **31**: 147-157.
- Lancaster, L., M. C. Kiel, et al. (2002). "Orientation of ribosome recycling factor in the ribosome from directed hydroxyl radical probing." Cell **111**(1): 129-40.
- Lodmell, J. S. and A. E. Dahlberg (1997). "A conformational switch in Escherichia coli 16S ribosomal RNA during decoding of messenger RNA." Science **277**(5330): 1262-7.
- Lu, M. and T. A. Steitz (2000). "Structure of Escherichia coli ribosomal protein L25 complexed with a 5S rRNA fragment at 1.8-Å resolution." Proc Natl Acad Sci U S A **97**(5): 2023-8.
- Maivali, U. and J. Remme (2004). "Definition of bases in 23S rRNA essential for ribosomal subunit association." RNA **10**(4): 600-4.
- Maki, Y., H. Yoshida, et al. (2000). "Two proteins, YfiA and YhbH, associated with resting ribosomes in stationary phase *Escherichia coli*." Genes Cells **5**(12): 965-74.
- Mandal, N. and U. L. RajBhandary (1992). "E.coli B lacks one of the two initiator tRNA species present in E.coli K-12." Journal of Bacteriology **175**(23): 7827-7830.
- McCarthy, B. J. (1962). "Effects of magnesium starvation on ribosome content of *E. coli*." Biochim. Biophys. Acta **55**: 880-888.
- McCutcheon, J. P., R. K. Agrawal, et al. (1999). "Location of translational initiation factor IF3 on the small ribosomal subunit." Proc. Natl. Acad. Sci. U.S.A. **96**(8): 4301-6.
- Meinzel, T., C. Sacerdot, et al. (1999). "Discrimination by Escherichia coli initiation factor IF3 against initiation on non-canonical codons relies on complementarity rules." J Mol Biol **290**(4): 825-37.
- Moazed, D. and H. F. Noller (1989). "Interaction of tRNA with 23S rRNA in the ribosomal A, P, and E sites." Cell **57**(4): 585-97.
- Moazed, D. and H. F. Noller (1989). "Intermediate states in the movement of transfer RNA in the ribosome." Nature **342**(6246): 142-8.
- Moazed, D., R. R. Samaha, et al. (1995). "Specific protection of 16 S rRNA by translational initiation factors." J. Mol. Biol. **248**(2): 207-10.
- Moreno, J. M., L. Drskjotersen, et al. (1999). "Characterization of the domains of *E. coli* initiation factor IF2 responsible for recognition of the ribosome." FEBS Lett **455**(1-2): 130-4.
- Murphy, F. V., V. Ramakrishnan, et al. (2004). "The role of modifications in codon discrimination by tRNA^{Lys} UUU." Nat Struct Mol Biol **11**(12): 1186-1191.
- Nakano, H., S. Uchiyama, et al. (2002). "Crystallization and preliminary X-ray crystallographic studies of a mutant of ribosome recycling factor from *E. coli*." Acta Crystallogr D Biol Crystallogr **58**: 124-126.
- Nakano, H., H. Yoshida, et al. (2003). "Structure and binding mode of a ribosome recycling factor (RRF) from mesophilic bacterium." J. Biol. Chem. **278**: 3427-3436.
- Nierhaus, K. H., C. M. Spahn, et al. (2000). "Ribosomal Elongation Cycle." The Ribosome: Structure, Function, Antibiotics and Cellular Interactions: 319-

335.

- Nissen, P., J. Hansen, et al. (2000). "The structural basis of ribosome activity in peptide bond synthesis." Science **289**(5481): 920-30.
- Nissen, P., J. A. Ippolito, et al. (2001). "RNA tertiary interactions in the large ribosomal subunit: the A-minor motif." Proc Natl Acad Sci U S A **98**(9): 4899-903.
- Ogawa, K. and A. Kaji (1975). "Requirements for ribosome-releasing factor for the release of ribosomes at the termination codon." Eur J Biochem **58**: 411-419.
- Ogle, J. M., D. E. Brodersen, et al. (2001). "Recognition of cognate transfer RNA by the 30S ribosomal subunit." Science **292**(5518): 897-902.
- Ogle, J. M., A. P. Carter, et al. (2003). "Insights into the decoding mechanism from recent ribosome structures." Trends Biochem Sci in press.
- Ogle, J. M., F. V. Murphy, et al. (2002). "Selection of tRNA by the Ribosome Requires a Transition from an Open to a Closed Form." Cell **111**(5): 721-32.
- Okuyama, A., N. Machiyama, et al. (1971). "Inhibition by kasugamycin of initiation complex formation on 30S ribosomes." Biochem Biophys Res Commun **43**: 196-199.
- Okuyama, A. and N. Tanaka (1972). "Differential effects of aminoglycosides on cistron-specific initiation of protein synthesis." Biochem Biophys Res Commun **49**(951-957).
- Otwinowski, Z. (1991). Isomorphous replacement and anomalous scattering. W. Wolf, P. R. Evans and A. G. W. Leslie. Warrington, UK, Daresbury Laboratory: 80-86.
- Pavlov, M. Y., D. V. Freistroffer, et al. (1997). "Fast recycling of Escherichia coli ribosomes requires both ribosome recycling factor (RRF) and release factor RF3." Embo J **16**(13): 4134-41.
- Pioletti, M., F. Schlunzen, et al. (2001). "Crystal structures of complexes of the small ribosomal subunit with tetracycline, edeine and IF3." Embo J **20**(8): 1829-39.
- Poldermans, B., N. Goosen, et al. (1979). "Studies on the function of two adjacent N6,N6-dimethyladenosines near 3'end of 16S ribosomal RNA of E. coli. I. The effect of kasugamycin on initiation of protein synthesis." J Biol Chem **254**: 9085-9089.
- Poole, E. and W. Tate (2000). "Release factors and their role as decoding proteins: specificity and fidelity for termination of protein synthesis." Biochim. Biophys. Acta **1493**: 1-11.
- Potapov, A. P. and A. R. Subramanian (1992). Biochem Int. **27**: 745-753.
- Prince, J. B., B. H. Taylor, et al. (1982). "Covalent crosslinking of tRNA¹Val to 16S RNA at the ribosomal P site: identification of crosslinked residues." Proc. Natl. Acad. Sci. U.S.A. **79**(18): 5450-4.
- Pyle, A. M. (2002). "Metal ions in the structure and function of RNA." J. Biol. Inorg. Chem. **7**: 679-690.
- Raj, V. S., H. Kaji, et al. (2005). "Interaction of RRF and EF-G from E. coli and T. thermophilus with ribosomes from both origins- insight into the mechanism

- of the ribosome recycling step." RNA **11**: 275-284.
- Rak, A., A. Kalinin, et al. (2002). "Solution structure of the ribosome-associated cold shock response protein Yfia of *Escherichia coli*." Biochem. Biophys. Res. Commun. **299**(5): 710-4.
- Ramakrishnan, V. and P. B. Moore (2001). "Atomic structures at last: the ribosome in 2000." Curr Opin Struct Biol **11**(2): 144-54.
- Ramesh, V., S. Gite, et al. (1997). "Suppressor mutations in *Escherichia coli* methionyl-tRNA formyltransferase: role of a 16-amino acid insertion module in initiator tRNA recognition." Proc. Natl. Acad. Sci. U.S.A. **94**(25): 13524-9.
- Ramos, A., S. Grunert, et al. (2000). "RNA recognition by a Staufen double-stranded RNA-binding domain." Embo J **19**(5): 997-1009.
- Rodnina, M. V., T. Pape, et al. (1996). "Initial binding of the elongation factor Tu.GTP.aminoacyl-tRNA complex preceding codon recognition on the ribosome." J. Biol. Chem. **271**(2): 646-52.
- Rodnina, M. V., A. Savelsbergh, et al. (1997). "Hydrolysis of GTP by elongation factor G drives tRNA movement on the ribosome." Nature **385**(6611): 37-41.
- Rolland, N., L. Janosi, et al. (1999). "Plant ribosome recycling factor homologue is a chloroplastic protein and is bactericidal in *E. coli* carrying temperature-sensitive ribosome recycling factor." Proc Natl Acad Sci U S A **96**: 5464-5469.
- Saenger, W. (1983). "Principles of Nucleic Acid Structure." Springer Verlag.
- Schlunzen, F., J. M. Harms, et al. (2003). "Structural basis for the antibiotic activity of ketolides and azalides." Structure (Camb) **11**(3): 329-38.
- Schlunzen, F., A. Tocilj, et al. (2000). "Structure of functionally activated small ribosomal subunit at 3.3 Å resolution." Cell **102**: 615-623.
- Schlunzen, F., R. Zarivach, et al. (2001). "Structural basis for the interaction of antibiotics with the peptidyl transferase centre in eubacteria." Nature **413**(6858): 814-21.
- Scolnick, E., R. Tompkins, et al. (1968). "Release factors differing in specificity for terminator codons." Proc Natl Acad Sci U S A **61**(2): 768-74.
- Selmer, M., S. Al-Karadaghi, et al. (1999). "Crystal structure of *Termotoga maritima* ribosome recycling factor: a tRNA mimic." Science **286**: 2349-2352.
- Semenkov, Y. P., M. V. Rodnina, et al. (2000). "Energetic contribution of tRNA hybrid state formation to translocation catalysis on the ribosome." Nat Struct Biol **7**(11): 1027-31.
- Sengupta, J., R. K. Agrawal, et al. (2001). "Visualization of protein S1 within the 30S ribosomal subunit and its interaction with messenger RNA." Proc Natl Acad Sci U S A **98**(21): 11991-6.
- Shatsky, I. N., A. V. Bakin, et al. (1991). "How does the mRNA pass through the ribosome." Biochimie **73**: 937-945.
- Spirin, A. (1999). "Ribosomes."
- Spirin, A. S., N. A. Kisselev, et al. (1963). Biokhimiya **28**: 920.
- Stark, H., E. V. Orlova, et al. (1997). "Arrangement of tRNAs in pre- and

- posttranslocational ribosomes revealed by electron cryomicroscopy." Cell **88**(1): 19-28.
- Stark, H., M. V. Rodnina, et al. (1997). "Visualization of elongation factor Tu on the *Escherichia coli* ribosome." Nature **389**(6649): 403-6.
- Stark, H., M. V. Rodnina, et al. (2000). "Large-scale movement of elongation factor G and extensive conformational change of the ribosome during translocation." Cell **100**(3): 301-9.
- Stark, H., M. V. Rodnina, et al. (2002). "Ribosome interactions of aminoacyl-tRNA and elongation factor Tu in the codon-recognition complex." Nat Struct Biol **9**(11): 849-54.
- Storoni, L. C., A. J. McCoy, et al. (2004). "Likelihood-enhanced fast rotation functions." Acta Crystallogr D Biol Crystallogr **60**(Pt 3): 432-8.
- Tai, P. C., B. J. Wallace, et al. (1973). "Actions of aurintricarboxylate, kasugamycin, and pactamycin on *E. coli* polysomes." Biochemistry **12**: 616-620.
- Tan, X., M. Varughese, et al. (1994). "A light-repressed transcript found in *Synechococcus* PCC 7002 is similar to a chloroplast-specific small subunit ribosomal protein and to a transcription modulator protein associated with sigma 54." J. Biol. Chem. **269**(33): 20905-12.
- Teixeira-Gomes, A. P., A. Cloeckert, et al. (2000). "Characterization of heat, oxidative, and acid stress response in *Brucella melitensis*." Infect. Immun. **68**: 2954-2961.
- Teyssier, E., G. Hirokawa, et al. (2003). "Temperature sensitive mutation in yeast mitochondrial ribosome recycling factor (RRF)." Nucleic Acids Res **31**: 4218-4226.
- Thieringer, H. A., P. G. Jones, et al. (1998). "Cold shock and adaptation." Bioessays **20**(1): 49-57.
- Tocilj, A., F. Schluenzen, et al. (1999). "The small ribosomal subunit from *Thermus thermophilus* at 4.5Å resolution: pattern fittings and the identification of a functional site." Proc Natl Acad Sci U S A **96**: 14252-14257.
- Toyoda, T., O. F. Tin, et al. (2000). "Crystal structure combined with genetic analysis of the *Thermus thermophilus* ribosome recycling factor shows that a flexible hinge may act as a functional switch." RNA **6**: 1432-1444.
- Tzareva, N. V., V. I. Makhno, et al. (1994). FEBS Lett **337**: 189-194.
- Uchida, T., M. Abe, et al. (1970). "Amounts of free 70S ribosomes and ribosomal subunits found in *Escherichia coli* at various temperatures." Biochem. Biophys. Res. Commun. **41**(4): 1048-54.
- Umezawa, H., M. Hamada, et al. (1965). "Kasugamycin, a new antibiotic." Antimicrob Agents Chemother **5**: 753-757.
- Valle, M., A. Zavialov, et al. (2003). "Incorporation of aminoacyl-tRNA into the ribosome as seen by cryo-electron microscopy." Nat Struct Biol **10**(11): 899-906.
- Valle, M., A. Zavialov, et al. (2003). "Locking and unlocking of ribosomal motions." Cell **114**(1): 123-34.
- VanBogelen, R. A. and F. C. Neidhardt (1990). "Ribosomes as sensors of heat

- and cold shock in *Escherichia coli*." Proc. Natl. Acad. Sci. U.S.A. **87**(15): 5589-93.
- Vester, B. (2001). "Macrolide resistance conferred by base substitutions in 23S rRNA." Antimicrob Agents Chemother **45**: 1-12.
- Vila-Sanjurjo, A. (2000). "GENETIC ANALYSIS OF THE DECODING CENTER OF E. COLI 16S rRNA." Thesis.
- Vila-Sanjurjo, A. and A. E. Dahlberg (2001). "Mutational analysis of the conserved bases C1402 and A1500 in the center of the decoding domain of *Escherichia coli* 16 S rRNA reveals an important tertiary interaction." J. Mol. Biol. **308**(3): 457-63.
- Vila-Sanjurjo, A., W. K. Ridgeway, et al. (2003). "X-ray crystal structures of the WT and a hyper-accurate ribosome from *Escherichia coli*." Proc. Natl. Acad. Sci. U.S.A. **100**(15): 8682-8687.
- Vila-Sanjurjo, A., B. S. Schuwirth, et al. (2004). "Structural basis for the control of translation initiation during stress." Nat Struct Mol Biol.
- Vila-Sanjurjo, A., C. L. Squires, et al. (1999). "Isolation of kasugamycin resistant mutants in the 16 S ribosomal RNA of *Escherichia coli*." J Mol Biol **293**(1): 1-8.
- von Ahsen, U. and H. F. Noller (1995). "Identification of bases in 16S rRNA essential for tRNA binding at the 30S ribosomal P site." Science **267**(5195): 234-7.
- Wada, A., Y. Yamazaki, et al. (1990). "Structure and probable genetic location of a "ribosome modulation factor" associated with 100S ribosomes in stationary-phase *Escherichia coli* cells." Proc Natl Acad Sci U S A **87**(7): 2657-61.
- Weber, M. H. and M. A. Marahiel (2003). "Bacterial cold shock responses." Sci Prog **86**(Pt 1-2): 9-75.
- Weber, M. H. W., W. Klein, et al. (2001). "Role of the bacillus subtilis fatty acid desaturase in membrane adaptation during cold shock." Mol. Microbiol. **39**: 1321-1329.
- Wilson, D. N., F. Schluenzen, et al. (2005). "X-ray crystallography study on ribosome recycling: the mechanism of binding and action of RRF on the 50S ribosomal subunit." Embo J **24**: 251-2620.
- Wimberly, B. T., D. E. Brodersen, et al. (2000). "Structure of the 30S ribosomal subunit." Nature **407**: 327-339.
- Wittmann, H. G. (1974). "Ribosomes." Cold Spring Harb Lab. Press, Plainview, NY: 93-114.
- Wittmann, H. G., J. Mussig, et al. (1982). "Crystallization of *Escherichia coli* ribosomes." FEBS Lett. **146**(1): 217-20.
- Woodcock, J., D. Moazed, et al. (1991). "Interaction of antibiotics with A- and P-site-specific bases in 16S ribosomal RNA." EMBO J. **10**(10): 3099-103.
- Wu, C. J. and U. L. RajBhandary (1997). "Effect of the amino acid attached to *E.coli* initiator tRNA on its affinity for the initiation factor IF2 and on the IF2 dependence of its binding to the ribosome." J. Biol. Chem. **272**: 1891-1895.
- Yamanaka, K. (1999). "Cold shock response in *E. coli*." J. Mol. Microbiol.

- Biotechnol. **1**: 193-202.
- Yang, H., F. Jossinet, et al. (2003). "Tools for the automatic identification and classification of RNA base pairs." Nucleic Acids Res. **31**(13): 3450-60.
- Ye, K., A. Serganov, et al. (2002). "Ribosome-associated factor Y adopts a fold resembling a double-stranded RNA binding domain scaffold." Eur. J. Biochem. **269**(21): 5182-91.
- Yonath, A., J. Mussig, et al. (1980). "Crystallization of the large ribosomal subunits from *Bacillus stearothermophilus*." Biochem. Int. **1**: 428-435.
- Yoshida, H., Y. Maki, et al. (2002). "The ribosome modulation factor (RMF) binding site on the 100S ribosome of *Escherichia coli*." J Biochem (Tokyo) **132**(6): 983-9.
- Yoshida, H., H. Yamamoto, et al. (2004). "RMF inactivates ribosomes by covering the peptidyl transferase centre and entrance of peptide exit tunnel." Genes Cells **9**(4): 271-8.
- Yoshida, T., S. Uchiyama, et al. (2001). "Solution structure of the ribosome recycling factor from *Aquifex aeolicus*." Biochemistry **40**: 2387-2396.
- Yusupov, M. M., G. Z. Yusupova, et al. (2001). "Crystal structure of the ribosome at 5.5 Å resolution." Science **292**(5518): 883-96.
- Yusupova, G. Z., M. M. Yusupov, et al. (2001). "The path of messenger RNA through the ribosome." Cell **106**(2): 233-41.
- Zamir, A., R. Miskin, et al. "The Interactivation and Reactivation of *E.coli* Ribosomes." Methods Enzymol: 406-426.
- Zavialov, A. V. and M. Ehrenberg (2003). "Peptidyl-tRNA Regulates the GTPase Activity of Translation Factors." Cell **114**(1): 113-22.
- Zengel, J. M. and L. Lindahl (1994). "Diverse mechanisms for regulating ribosomal protein synthesis in *Escherichia coli*." Prog Nucleic Acid Res Mol Biol **47**: 331-70.