

REFERENCES BIBLIOGRAPHIQUES

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- Acevedo, R., Samaniego, R., and Moreno Diaz de la Espina, S. (2002). Coiled bodies in nuclei from plant cells evolving from dormancy to proliferation. *Chromosoma* *110*, 559-569.
- Aittaleb, M., Rashid, R., Chen, Q., Palmer, J. R., Daniels, C. J., and Li, H. (2003). Structure and function of archaeal box C/D sRNP core proteins. *Nat Struct Biol* *10*, 256-263.
- Allmang, C., Kufel, J., Chanfreau, G., Mitchell, P., Petfalski, E., and Tollervey, D. (1999). Functions of the exosome in rRNA, snoRNA and snRNA synthesis. *Embo J* *18*, 5399-5410.
- Amaldi, F., and Pierandrei-Amaldi, P. (1997). TOP genes: a translationally controlled class of genes including those coding for ribosomal proteins. *Prog Mol Subcell Biol* *18*, 1-17.
- Andersen, J. S., Lam, Y. W., Leung, A. K., Ong, S. E., Lyon, C. E., Lamond, A. I., and Mann, M. (2005). Nucleolar proteome dynamics. *Nature* *433*, 77-83.
- Andersen, J. S., Lyon, C. E., Fox, A. H., Leung, A. K., Lam, Y. W., Steen, H., Mann, M., and Lamond, A. I. (2002). Directed proteomic analysis of the human nucleolus. *Curr Biol* *12*, 1-11.
- Andrade, L. E., Chan, E. K., Raska, I., Peebles, C. L., Roos, G., and Tan, E. M. (1991). Human autoantibody to a novel protein of the nuclear coiled body: immunological characterization and cDNA cloning of p80-coilin. *J Exp Med* *173*, 1407-1419.
- Antal, M., Boros, E., Solymosy, F., and Kiss, T. (2002). Analysis of the structure of human telomerase RNA in vivo. *Nucleic Acids Res* *30*, 912-920.
- Artandi, S. E., Chang, S., Lee, S. L., Alson, S., Gottlieb, G. J., Chin, L., and DePinho, R. A. (2000). Telomere dysfunction promotes non-reciprocal translocations and epithelial cancers in mice. *Nature* *406*, 641-645.
- Atzorn, V., Fragapane, P., and Kiss, T. (2004). U17/snr30 is a ubiquitous snoRNA with two conserved sequence motifs essential for 18S rRNA production. *Mol Cell Biol* *24*, 1769-1778.
- Bachand, F., and Autexier, C. (2001). Functional regions of human telomerase reverse transcriptase and human telomerase RNA required for telomerase activity and RNA-protein interactions. *Mol Cell Biol* *21*, 1888-1897.
- Bachand, F., Boisvert, F. M., Cote, J., Richard, S., and Autexier, C. (2002). The product of the survival of motor neuron (SMN) gene is a human telomerase-associated protein. *Mol Biol Cell* *13*, 3192-3202.
- Bachellerie, J. P., Cavaille, J., and Huttenhofer, A. (2002). The expanding snoRNA world. *Biochimie* *84*, 775-790.
- Badis, G., Fromont-Racine, M., and Jacquier, A. (2003). A snoRNA that guides the two most conserved pseudouridine modifications within rRNA confers a growth advantage in yeast. *Rna* *9*, 771-779.
- Bagni, C., and Lapeyre, B. (1998). Gar1p binds to the small nucleolar RNAs snR10 and snR30 in vitro through a nontypical RNA binding element. *J Biol Chem* *273*, 10868-10873.

125

Baker, D. L., Youssef, O. A., Chastkofsky, M. I., Dy, D. A., Terns, R. M., and Terns, M. P. (2005). RNA-guided RNA modification: functional organization of the archaeal H/ACA RNP. *Genes Dev* *19*, 1238-1248.

Balakin, A. G., Smith, L., and Fournier, M. J. (1996). The RNA world of the nucleolus: two major families of small RNAs defined by different box elements with related functions. *Cell* *86*, 823-834.

Ballarino, M., Morlando, M., Pagano, F., Fatica, A., and Bozzoni, I. (2005). The

cotranscriptional assembly of snoRNPs controls the biosynthesis of H/ACA snoRNAs in *Saccharomyces cerevisiae*. *Mol Cell Biol* 25, 5396-5403.

Barneche, F., Gaspin, C., Guyot, R., and Echeverria, M. (2001). Identification of 66 box C/D snoRNAs in *Arabidopsis thaliana*: extensive gene duplications generated multiple isoforms predicting new ribosomal RNA 2'-O-methylation sites. *J Mol Biol* 311, 57-73.

Bauer, D. W., and Gall, J. G. (1997). Coiled bodies without coilin. *Mol Biol Cell* 8, 73-82.

Bauer, D. W., Murphy, C., Wu, Z., Wu, C. H., and Gall, J. G. (1994). In vitro assembly of coiled bodies in *Xenopus* egg extract. *Mol Biol Cell* 5, 633-644.

Beattie, T. L., Zhou, W., Robinson, M. O., and Harrington, L. (1998). Reconstitution of human telomerase activity in vitro. *Curr Biol* 8, 177-180.

Beattie, T. L., Zhou, W., Robinson, M. O., and Harrington, L. (2001). Functional multimerization of the human telomerase reverse transcriptase. *Mol Cell Biol* 21, 6151-6160.

Behm-Ansmant, I., Urban, A., Ma, X., Yu, Y. T., Motorin, Y., and Branlant, C. (2003). The *Saccharomyces cerevisiae* U2 snRNA:pseudouridine-synthase Pus7p is a novel multisitemultisubstrate RNA:Psi-synthase also acting on tRNAs. *Rna* 9, 1371-1382.

Bertrand, E., Houser-Scott, F., Kendall, A., Singer, R. H., and Engelke, D. R. (1998). Nucleolar localization of early tRNA processing. *Genes Dev* 12, 2463-2468.

Blasco, M. A., Lee, H. W., Hande, M. P., Samper, E., Lansdorp, P. M., DePinho, R. A., and Greider, C. W. (1997). Telomere shortening and tumor formation by mouse cells lacking telomerase RNA. *Cell* 91, 25-34.

Bleoo, S., Sun, X., Hendzel, M. J., Rowe, J. M., Packer, M., and Godbout, R. (2001). Association of human DEAD box protein DDX1 with a cleavage stimulation factor involved in 3'-end processing of pre-mRNA. *Mol Biol Cell* 12, 3046-3059.

Boisvert, F. M., Cote, J., Boulanger, M. C., Cleroux, P., Bachand, F., Autexier, C., and Richard, S. (2002). Symmetrical dimethylarginine methylation is required for the localization of SMN in Cajal bodies and pre-mRNA splicing. *J Cell Biol* 159, 957-969.

Boisvert, F. M., Hendzel, M. J., and Bazett-Jones, D. P. (2000). Promyelocytic leukemia (PML) nuclear bodies are protein structures that do not accumulate RNA. *J Cell Biol* 148, 283-292.

126

Bonnerot, C., Pintard, L., and Lutfalla, G. (2003). Functional redundancy of Spb1p and a snR52-dependent mechanism for the 2'-O-ribose methylation of a conserved rRNA position in yeast. *Mol Cell* 12, 1309-1315.

Borovjagin, A. V., and Gerbi, S. A. (1999). U3 small nucleolar RNA is essential for cleavage at sites 1, 2 and 3 in pre-rRNA and determines which rRNA processing pathway is taken in *Xenopus* oocytes. *J Mol Biol* 286, 1347-1363.

Borovjagin, A. V., and Gerbi, S. A. (2001). *Xenopus* U3 snoRNA GAC-Box A' and Box A sequences play distinct functional roles in rRNA processing. *Mol Cell Biol* 21, 6210-6221.

Bortolin, M. L., Ganot, P., and Kiss, T. (1999). Elements essential for accumulation and function of small nucleolar RNAs directing site-specific pseudouridylation of ribosomal RNAs. *Embo J* 18, 457-469.

Boudonck, K., Dolan, L., and Shaw, P. J. (1999). The movement of coiled bodies visualized in living plant cells by the green fluorescent protein. *Mol Biol Cell* 10, 2297-2307.

Boulon, S., Verheggen, C., Jady, B. E., Girard, C., Pescia, C., Paul, C., Ospina, J. K., Kiss, T., Matera, A. G., Bordonne, R., and Bertrand, E. (2004). PHAX and CRM1 are required sequentially to transport U3 snoRNA to nucleoli. *Mol Cell* 16, 777-787.

- Bousquet-Antonelli, C., Henry, Y., G'Elugne J, P., Caizergues-Ferrer, M., and Kiss, T. (1997). A small nucleolar RNP protein is required for pseudouridylation of eukaryotic ribosomal RNAs. *Embo J* *16*, 4770-4776.
- Brown, J. W., Clark, G. P., Leader, D. J., Simpson, C. G., and Lowe, T. (2001). Multiple snoRNA gene clusters from Arabidopsis. *Rna* *7*, 1817-1832.
- Brown, J. W., Echeverria, M., Qu, L. H., Lowe, T. M., Bachellerie, J. P., Huttenhofer, A., Kastenmayer, J. P., Green, P. J., Shaw, P., and Marshall, D. F. (2003). Plant snoRNA database. *Nucleic Acids Res* *31*, 432-435.
- Bryan, T. M., Goodrich, K. J., and Cech, T. R. (2000). Telomerase RNA bound by protein motifs specific to telomerase reverse transcriptase. *Mol Cell* *6*, 493-499.
- Bryan, T. M., Goodrich, K. J., and Cech, T. R. (2003). Tetrahymena telomerase is active as a monomer. *Mol Biol Cell* *14*, 4794-4804.
- Bugl, H., Fauman, E. B., Staker, B. L., Zheng, F., Kushner, S. R., Saper, M. A., Bardwell, J. C., and Jakob, U. (2000). RNA methylation under heat shock control. *Mol Cell* *6*, 349-360.
- Caffarelli, E., Arese, M., Santoro, B., Fragapane, P., and Bozzoni, I. (1994). In vitro study of processing of the intron-encoded U16 small nucleolar RNA in *Xenopus laevis*. *Mol Cell Biol* *14*, 2966-2974.
- Caffarelli, E., Fatica, A., Prislei, S., De Gregorio, E., Fragapane, P., and Bozzoni, I. (1996). Processing of the intron-encoded U16 and U18 snoRNAs: the conserved C and D boxes control both the processing reaction and the stability of the mature snoRNA. *Embo J* *15*, 1121-1131.
- 127
- Caffarelli, E., Losito, M., Giorgi, C., Fatica, A., and Bozzoni, I. (1998). In vivo identification of nuclear factors interacting with the conserved elements of box C/D small nucleolar RNAs. *Mol Cell Biol* *18*, 1023-1028.
- Cahill, N. M., Friend, K., Speckmann, W., Li, Z. H., Terns, R. M., Terns, M. P., and Steitz, J. A. (2002). Site-specific cross-linking analyses reveal an asymmetric protein distribution for a box C/D snoRNP. *Embo J* *21*, 3816-3828.
- Cajal, S. (1903). Un sencillo metodo de coloracion seletiva del reticulo protoplasmatico y sus efectos en los diversos organos nerviosos de vertebrados e invertebrados., Vol 2 (Madrid).
- Caldas, T., Binet, E., Boulloc, P., Costa, A., Desgres, J., and Richarme, G. (2000a). The FtsJ/RrmJ heat shock protein of *Escherichia coli* is a 23 S ribosomal RNA methyltransferase. *J Biol Chem* *275*, 16414-16419.
- Caldas, T., Binet, E., Boulloc, P., and Richarme, G. (2000b). Translational defects of *Escherichia coli* mutants deficient in the Um(2552) 23S ribosomal RNA methyltransferase RrmJ/FtsJ. *Biochem Biophys Res Commun* *271*, 714-718.
- Carbone, R., Pearson, M., Minucci, S., and Pelicci, P. G. (2002). PML NBs associate with the hMre11 complex and p53 at sites of irradiation induced DNA damage. *Oncogene* *21*, 1633-1640.
- Carmo-Fonseca, M., Ferreira, J., and Lamond, A. I. (1993). Assembly of snRNP-containing coiled bodies is regulated in interphase and mitosis--evidence that the coiled body is a kinetic nuclear structure. *J Cell Biol* *120*, 841-852.
- Carmo-Fonseca, M., Pepperkok, R., Carvalho, M. T., and Lamond, A. I. (1992). Transcription-dependent colocalization of the U1, U2, U4/U6, and U5 snRNPs in coiled bodies. *J Cell Biol* *117*, 1-14.
- Carter, K. C., Taneja, K. L., and Lawrence, J. B. (1991). Discrete nuclear domains of poly(A) RNA and their relationship to the functional organization of the nucleus. *J Cell Biol* *115*,

1191-1202.

Cavaille, J., and Bachellerie, J. P. (1996). Processing of fibrillarin-associated snoRNAs from pre-mRNA introns: an exonucleolytic process exclusively directed by the common stem-box terminal structure. *Biochimie* 78, 443-456.

Cavaille, J., Buiting, K., Kieffmann, M., Lalande, M., Brannan, C. I., Horsthemke, B., Bachellerie, J. P., Brosius, J., and Huttenhofer, A. (2000). Identification of brain-specific and imprinted small nucleolar RNA genes exhibiting an unusual genomic organization. *Proc Natl Acad Sci U S A* 97, 14311-14316.

Cavaille, J., Nicoloso, M., and Bachellerie, J. P. (1996). Targeted ribose methylation of RNA in vivo directed by tailored antisense RNA guides. *Nature* 383, 732-735.

Cavaille, J., Seitz, H., Paulsen, M., Ferguson-Smith, A. C., and Bachellerie, J. P. (2002). Identification of tandemly-repeated C/D snoRNA genes at the imprinted human 14q32 domain reminiscent of those at the Prader-Willi/Angelman syndrome region. *Hum Mol Genet* 11, 1527-1538.

128

Cavaille, J., Vitali, P., Basyuk, E., Huttenhofer, A., and Bachellerie, J. P. (2001). A novel brain-specific box C/D small nucleolar RNA processed from tandemly repeated introns of a noncoding RNA gene in rats. *J Biol Chem* 276, 26374-26383.

Cecconi, F., Mariottini, P., and Amaldi, F. (1995). The *Xenopus* intron-encoded U17 snoRNA is produced by exonucleolytic processing of its precursor in oocytes. *Nucleic Acids Res* 23, 4670-4676.

Chanfreau, G., Legrain, P., and Jacquier, A. (1998a). Yeast RNase III as a key processing enzyme in small nucleolar RNAs metabolism. *J Mol Biol* 284, 975-988.

Chanfreau, G., Rotondo, G., Legrain, P., and Jacquier, A. (1998b). Processing of a dicistronic small nucleolar RNA precursor by the RNA endonuclease Rnt1. *Embo J* 17, 3726-3737.

Charpentier, B., Muller, S., and Branlant, C. (2005). Reconstitution of archaeal H/ACA small ribonucleoprotein complexes active in pseudouridylation. *Nucleic Acids Res* 33, 3133-3144.

Chen, C. L., Liang, D., Zhou, H., Zhuo, M., Chen, Y. Q., and Qu, L. H. (2003). The high diversity of snoRNAs in plants: identification and comparative study of 120 snoRNA genes from *Oryza sativa*. *Nucleic Acids Res* 31, 2601-2613.

Chen, D., and Huang, S. (2001). Nucleolar components involved in ribosome biogenesis cycle between the nucleolus and nucleoplasm in interphase cells. *J Cell Biol* 153, 169-176.

Chen, J. L., Blasco, M. A., and Greider, C. W. (2000). Secondary structure of vertebrate telomerase RNA. *Cell* 100, 503-514.

Chen, J. L., and Greider, C. W. (2004a). An emerging consensus for telomerase RNA structure. *Proc Natl Acad Sci U S A* 101, 14683-14684.

Chen, J. L., and Greider, C. W. (2004b). Telomerase RNA structure and function: implications for dyskeratosis congenita. *Trends Biochem Sci* 29, 183-192.

Chen, J. L., and Greider, C. W. (2005). Functional analysis of the pseudoknot structure in human telomerase RNA. *Proc Natl Acad Sci U S A* 102, 8080-8085; discussion 8077-8089.

Chen, J. L., Opperman, K. K., and Greider, C. W. (2002). A critical stem-loop structure in the CR4-CR5 domain of mammalian telomerase RNA. *Nucleic Acids Res* 30, 592-597.

Chen, T., Boisvert, F. M., Bazett-Jones, D. P., and Richard, S. (1999). A role for the GSG domain in localizing Sam68 to novel nuclear structures in cancer cell lines. *Mol Biol Cell* 10, 3015-3033.

Cioce, M., and Lamond, A. I. (2005). Cajal Bodies: A Long History of Discovery. *Annu Rev Cell Dev Biol*.

- Clouet d'Orval, B., Bortolin, M. L., Gaspin, C., and Bachellerie, J. P. (2001). Box C/D RNA guides for the ribose methylation of archaeal tRNAs. The tRNA^{Trp} intron guides the formation of two ribose-methylated nucleosides in the mature tRNA^{Trp}. *Nucleic Acids Res* 29, 4518-4529.
- Cmarko, D., Verschure, P. J., Martin, T. E., Dahmus, M. E., Krause, S., Fu, X. D., van Driel, R., and Fakan, S. (1999). Ultrastructural analysis of transcription and splicing in the cell nucleus after bromo-UTP microinjection. *Mol Biol Cell* 10, 211-223.
- Collins, K., and Mitchell, J. R. (2002). Telomerase in the human organism. *Oncogene* 21, 564-579.
- Conlan, L. A., McNees, C. J., and Heierhorst, J. (2004). Proteasome-dependent dispersal of PML nuclear bodies in response to alkylating DNA damage. *Oncogene* 23, 307-310.
- Daelemans, D., Costes, S. V., Cho, E. H., Erwin-Cohen, R. A., Lockett, S., and Pavlakis, G. N. (2004). In vivo HIV-1 Rev multimerization in the nucleolus and cytoplasm identified by fluorescence resonance energy transfer. *J Biol Chem* 279, 50167-50175.
- Darzacq, X., Jady, B. E., Verheggen, C., Kiss, A. M., Bertrand, E., and Kiss, T. (2002). Cajal body-specific small nuclear RNAs: a novel class of 2'-O-methylation and pseudouridylation guide RNAs. *Embo J* 21, 2746-2756.
- Darzacq, X., and Kiss, T. (2000). Processing of intron-encoded box C/D small nucleolar RNAs lacking a 5',3'-terminal stem structure. *Mol Cell Biol* 20, 4522-4531.
- Darzacq, X., Kittur, N., Roy, S., Shav-Tal, Y., Singer, R. H., and Meier, U. T. (2006). Stepwise RNP assembly at the site of H/ACA RNA transcription in human cells. *J Cell Biol.*
- Darzacq, X., Kittur, N., Roy, S., Shav-Tal, Y., Singer, R.H., Meier, U.T. (2006). Stepwise RNP assembly at the site of H/ACA RNA transcription in human Cells. *JCB*, in press.
- de Lange, T. (2005). Shelterin: the protein complex that shapes and safeguards human telomeres. *Genes Dev* 19, 2100-2110.
- de Turris, V., Di Leva, G., Caldarola, S., Loreni, F., Amaldi, F., and Bozzoni, I. (2004). TOP promoter elements control the relative ratio of intron-encoded snoRNA versus spliced mRNA biosynthesis. *J Mol Biol* 344, 383-394.
- Decatur, W. A., and Fournier, M. J. (2002). rRNA modifications and ribosome function. *Trends Biochem Sci* 27, 344-351.
- Dellaire, G., and Bazett-Jones, D. P. (2004). PML nuclear bodies: dynamic sensors of DNA damage and cellular stress. *Bioessays* 26, 963-977.
- Dellaire, G., Ching, R. W., Dehghani, H., Ren, Y., and Bazett-Jones, D. P. (2006a). The number of PML nuclear bodies increases in early S phase by a fission mechanism. *J Cell Sci* 119, 1026-1033.
- Dellaire, G., Eskiw, C. H., Dehghani, H., Ching, R. W., and Bazett-Jones, D. P. (2006b). Mitotic accumulations of PML protein contribute to the re-establishment of PML nuclear bodies in G1. *J Cell Sci* 119, 1034-1042.
- Dellaire, G., Farrall, R., and Bickmore, W. A. (2003). The Nuclear Protein Database (NPD): sub-nuclear localisation and functional annotation of the nuclear proteome. *Nucleic Acids Res* 31, 328-330.
- 130
- Deryusheva, S., and Gall, J. G. (2004). Dynamics of coilin in Cajal bodies of the *Xenopus* germinal vesicle. *Proc Natl Acad Sci U S A* 101, 4810-4814.
- Dez, C., Henras, A., Faucon, B., Lafontaine, D., Caizergues-Ferrer, M., and Henry, Y. (2001). Stable expression in yeast of the mature form of human telomerase RNA depends on its association with the box H/ACA small nucleolar RNP proteins Cbf5p, Nhp2p and Nop10p.

Nucleic Acids Res 29, 598-603.

Dez, C., Noaillac-Depeyre, J., Caizergues-Ferrer, M., and Henry, Y. (2002). Naf1 p, an essential nucleoplasmic factor specifically required for accumulation of box H/ACA small nucleolar RNPs. *Mol Cell Biol* 22, 7053-7065.

Dheur, S., Voile, T. A., Voisinet-Hakil, F., Minet, M., Schmitter, J. M., Lacroute, F., Wyers, F., and Minvielle-Sebastia, L. (2003). Pti1 p and Ref2p found in association with the mRNA 3' end formation complex direct snoRNA maturation. *Embo J* 22, 2831-2840.

Donmez, G., Hartmuth, K., and Luhrmann, R. (2004). Modified nucleotides at the 5' end of human U2 snRNA are required for spliceosomal E-complex formation. *Rna* 10, 1925-1933.

Dragon, F., Gallagher, J. E., Compagnone-Post, P. A., Mitchell, B. M., Porwancher, K. A., Wehner, K. A., Wormsley, S., Settlage, R. E., Shabanowitz, J., Osheim, Y., *et al.* (2002). A large nucleolar U3 ribonucleoprotein required for 18S ribosomal RNA biogenesis. *Nature* 417, 967-970.

Dragon, F., Pogacic, V., and Filipowicz, W. (2000). In vitro assembly of human H/ACA small nucleolar RNPs reveals unique features of U17 and telomerase RNAs. *Mol Cell Biol* 20, 3037-3048.

Dundr, M., Hebert, M. D., Karpova, T. S., Stanek, D., Xu, H., Shpargel, K. B., Meier, U. T., Neugebauer, K. M., Matera, A. G., and Misteli, T. (2004). In vivo kinetics of Cajal body components. *J Cell Biol* 164, 831-842.

Dundr, M., and Misteli, T. (2001). Functional architecture in the cell nucleus. *Biochem J* 356, 297-310.

Dundr, M., Misteli, T., and Olson, M. O. (2000). The dynamics of postmitotic reassembly of the nucleolus. *J Cell Biol* 150, 433-446.

Dyck, J. A., Maul, G. G., Miller, W. H., Jr., Chen, J. D., Kakizuka, A., and Evans, R. M. (1994). A novel macromolecular structure is a target of the promyelocyte-retinoic acid receptor oncoprotein. *Cell* 76, 333-343.

Enright, C. A., Maxwell, E. S., Eliceiri, G. L., and Sollner-Webb, B. (1996). 5'ETS rRNA processing facilitated by four small RNAs: U14, E3, U17, and U3. *Rna* 2, 1094-1099.

Eo, H. S., Jo, K. S., Lee, S. W., Kim, C. B., and Kim, W. (2005). A combined approach for locating box H/ACA snoRNAs in the human genome. *Mol Cells* 20, 35-42.

Eskiw, C. H., Dellaire, G., and Bazett-Jones, D. P. (2004). Chromatin contributes to structural integrity of promyelocytic leukemia bodies through a SUMO-1-independent mechanism. *J Biol Chem* 279, 9577-9585.

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Etheridge, K. T., Banik, S. S., Armbruster, B. N., Zhu, Y., Terns, R. M., Terns, M. P., and Counter, C. M. (2002). The nucleolar localization domain of the catalytic subunit of human telomerase. *J Biol Chem* 277, 24764-24770.

Fatica, A., Dlakic, M., and Tollervey, D. (2002). Naf1 p is a box H/ACA snoRNP assembly factor. *Rna* 8, 1502-1514.

Fatica, A., Morlando, M., and Bozzoni, I. (2000). Yeast snoRNA accumulation relies on a cleavage-dependent/polyadenylation-independent 3'-processing apparatus. *Embo J* 19, 6218-6229.

Feder, M., Pas, J., Wyrwicz, L. S., and Bujnicki, J. M. (2003). Molecular phylogenetics of the RrmJ/fibrillar superfamily of ribose 2'-O-methyltransferases. *Gene* 302, 129-138.

Ferreira, J. A., Carmo-Fonseca, M., and Lamond, A. I. (1994). Differential interaction of splicing snRNPs with coiled bodies and interchromatin granules during mitosis and assembly of daughter cell nuclei. *J Cell Biol* 126, 11-23.

- Filipowicz, W., and Pogacic, V. (2002). Biogenesis of small nucleolar ribonucleoproteins. *Curr Opin Cell Biol* *14*, 319-327.
- Fischer, U., Liu, Q., and Dreyfuss, G. (1997). The SMN-SIP1 complex has an essential role in spliceosomal snRNP biogenesis. *Cell* *90*, 1023-1029.
- Fox, A. H., Lam, Y. W., Leung, A. K., Lyon, C. E., Andersen, J., Mann, M., and Lamond, A. I. (2002). Paraspeckles: a novel nuclear domain. *Curr Biol* *12*, 13-25.
- Fragapane, P., Prislei, S., Michienzi, A., Caffarelli, E., and Bozzoni, I. (1993). A novel small nucleolar RNA (U16) is encoded inside a ribosomal protein intron and originates by processing of the pre-mRNA. *Embo J* *12*, 2921-2928.
- Frey, M. R., and Matera, A. G. (1995). Coiled bodies contain U7 small nuclear RNA and associate with specific DNA sequences in interphase human cells. *Proc Natl Acad Sci U S A* *92*, 5915-5919.
- Frey, M. R., and Matera, A. G. (2001). RNA-mediated interaction of Cajal bodies and U2 snRNA genes. *J Cell Biol* *154*, 499-509.
- Friedman, K. L., and Cech, T. R. (1999). Essential functions of amino-terminal domains in the yeast telomerase catalytic subunit revealed by selection for viable mutants. *Genes Dev* *13*, 2863-2874.
- Fu, D., and Collins, K. (2003). Distinct biogenesis pathways for human telomerase RNA and H/ACA small nucleolar RNAs. *Mol Cell* *11*, 1361-1372.
- Fu, D., and Collins, K. (2006). Human telomerase and Cajal body ribonucleoproteins share a unique specificity of Sm protein association. *Genes Dev* *20*, 531-536.
- Galardi, S., Fatica, A., Bachi, A., Scaloni, A., Presutti, C., and Bozzoni, I. (2002). Purified box C/D snoRNPs are able to reproduce site-specific 2'-O-methylation of target RNA in vitro. *Mol Cell Biol* *22*, 6663-6668.
- Gall, J. G. (2000). Cajal bodies: the first 100 years. *Annu Rev Cell Dev Biol* *16*, 273-300.
- Gall, J. G., Bellini, M., Wu, Z., and Murphy, C. (1999). Assembly of the nuclear transcription and processing machinery: Cajal bodies (coiled bodies) and transcriptosomes. *Mol Biol Cell* *10*, 4385-4402.
- Gall, J. G., Tsvetkov, A., Wu, Z., and Murphy, C. (1995). Is the sphere organelle/coiled body a universal nuclear component? *Dev Genet* *16*, 25-35.
- Ganot, P., Bortolin, M. L., and Kiss, T. (1997a). Site-specific pseudouridine formation in preribosomal RNA is guided by small nucleolar RNAs. *Cell* *89*, 799-809.
- Ganot, P., Caizergues-Ferrer, M., and Kiss, T. (1997b). The family of box ACA small nucleolar RNAs is defined by an evolutionarily conserved secondary structure and ubiquitous sequence elements essential for RNA accumulation. *Genes Dev* *11*, 941-956.
- Ganot, P., Jady, B. E., Bortolin, M. L., Darzacq, X., and Kiss, T. (1999). Nucleolar factors direct the 2'-O-ribose methylation and pseudouridylation of U6 spliceosomal RNA. *Mol Cell Biol* *19*, 6906-6917.
- Gao, L., Frey, M. R., and Matera, A. G. (1997). Human genes encoding U3 snRNA associate with coiled bodies in interphase cells and are clustered on chromosome 17p11.2 in a complex inverted repeat structure. *Nucleic Acids Res* *25*, 4740-4747.
- Gedge, L. J., Morrison, E. E., Blair, G. E., and Walker, J. H. (2005). Nuclear actin is partially associated with Cajal bodies in human cells in culture and relocates to the nuclear periphery after infection of cells by adenovirus 5. *Exp Cell Res* *303*, 229-239.
- Gerbi, S. A., Borovjagin, A. V., Ezrokhi, M., and Lange, T. S. (2001). Ribosome biogenesis: role of small nucleolar RNA in maturation of eukaryotic rRNA. *Cold Spring Harb Symp Quant Biol* *66*, 575-590.

- Gerbi, S. A., Borovjagin, A. V., Odreman, F. E., and Lange, T. S. (2003). U4 snRNA nucleolar localization requires the NHPX/15.5-kD protein binding site but not Sm protein or U6 snRNA association. *J Cell Biol* *162*, 821-832.
- Gerbi, S. A., and Lange, T. S. (2002). All small nuclear RNAs (snRNAs) of the [U4/U6.U5] Tri-snRNP localize to nucleoli; Identification of the nucleolar localization element of U6 snRNA. *Mol Biol Cell* *13*, 3123-3137.
- Ghetti, A., Pinol-Roma, S., Michael, W. M., Morandi, C., and Dreyfuss, G. (1992). hnRNP I, the polypyrimidine tract-binding protein: distinct nuclear localization and association with hnRNAs. *Nucleic Acids Res* *20*, 3671-3678.
- Giorgi, C., Fatica, A., Nagel, R., and Bozzoni, I. (2001). Release of U18 snoRNA from its host intron requires interaction of Nop1p with the Rnt1p endonuclease. *Embo J* *20*, 6856-6865.
- Girard, J. P., Bagni, C., Caizergues-Ferrer, M., Amalric, F., and Lapeyre, B. (1994). Identification of a segment of the small nucleolar ribonucleoprotein-associated protein GAR1 that is sufficient for nucleolar accumulation. *J Biol Chem* *269*, 18499-18506.
- Girard, J. P., Lehtonen, H., Caizergues-Ferrer, M., Amalric, F., Tollervey, D., and Lapeyre, B. (1992). GAR1 is an essential small nucleolar RNP protein required for pre-rRNA processing in yeast. *Embo J* *11*, 673-682.
- Godbout, R., and Squire, J. (1993). Amplification of a DEAD box protein gene in retinoblastoma cell lines. *Proc Natl Acad Sci U S A* *90*, 7578-7582.
- Gorisch, S. M., Wachsmuth, M., Ittrich, C., Bacher, C. P., Rippe, K., and Lichter, P. (2004). Nuclear body movement is determined by chromatin accessibility and dynamics. *Proc Natl Acad Sci U S A* *101*, 13221-13226.
- Gornemann, J., Kotovic, K. M., Hujer, K., and Neugebauer, K. M. (2005). Cotranscriptional spliceosome assembly occurs in a stepwise fashion and requires the cap binding complex. *Mol Cell* *19*, 53-63.
- Granneman, S., Vogelzangs, J., Luhrmann, R., van Venrooij, W. J., Pruijn, G. J., and Watkins, N. J. (2004). Role of pre-rRNA base pairing and 80S complex formation in subnucleolar localization of the U3 snoRNP. *Mol Cell Biol* *24*, 8600-8610.
- Green, R., and Noller, H. F. (1996). In vitro complementation analysis localizes 23S rRNA posttranscriptional modifications that are required for Escherichia coli 50S ribosomal subunit assembly and function. *Rna* *2*, 1011-1021.
- Greider, C. W., and Blackburn, E. H. (1985). Identification of a specific telomere terminal transferase activity in Tetrahymena extracts. *Cell* *43*, 405-413.
- Grobelny, J. V., Godwin, A. K., and Broccoli, D. (2000). ALT-associated PML bodies are present in viable cells and are enriched in cells in the G(2)/M phase of the cell cycle. *J Cell Sci* *113 Pt 24*, 4577-4585.
- Grosshans, H., Deinert, K., Hurt, E., and Simos, G. (2001). Biogenesis of the signal recognition particle (SRP) involves import of SRP proteins into the nucleolus, assembly with the SRP-RNA, and Xpo1p-mediated export. *J Cell Biol* *153*, 745-762.
- Gu, A. D., Zhou, H., Yu, C. H., and Qu, L. H. (2005). A novel experimental approach for systematic identification of box H/ACA snoRNAs from eukaryotes. *Nucleic Acids Res* *33*, e194.
- Gu, J., Patton, J. R., Shimba, S., and Reddy, R. (1996). Localization of modified nucleotides in Schizosaccharomyces pombe spliceosomal small nuclear RNAs: modified nucleotides are clustered in functionally important regions. *Rna* *2*, 909-918.
- Gubitz, A. K., Feng, W., and Dreyfuss, G. (2004). The SMN complex. *Exp Cell Res* *296*, 51-

- Guo, A., Salomoni, P., Luo, J., Shih, A., Zhong, S., Gu, W., and Pandolfi, P. P. (2000). The function of PML in p53-dependent apoptosis. *Nat Cell Biol* 2, 730-736.
- Gustafsson, C., and Persson, B. C. (1998). Identification of the *rrmA* gene encoding the 23S rRNA m1G745 methyltransferase in *Escherichia coli* and characterization of an m1G745-deficient mutant. *J Bacteriol* 180, 359-365.
- Hamma, T., Reichow, S. L., Varani, G., and Ferre-D'Amare, A. R. (2005). The Cbf5-Nop10 complex is a molecular bracket that organizes box H/ACA RNPs. *Nat Struct Mol Biol* 12, 1101-1107.
- Harrington, L., McPhail, T., Mar, V., Zhou, W., Oulton, R., Bass, M. B., Arruda, I., and Robinson, M. O. (1997a). A mammalian telomerase-associated protein. *Science* 275, 973-977.
- Harrington, L., Zhou, W., McPhail, T., Oulton, R., Yeung, D. S., Mar, V., Bass, M. B., and Robinson, M. O. (1997b). Human telomerase contains evolutionarily conserved catalytic and structural subunits. *Genes Dev* 11, 3109-3115.
- Hebert, M. D., and Matera, A. G. (2000). Self-association of coilin reveals a common theme in nuclear body localization. *Mol Biol Cell* 11, 4159-4171.
- Hebert, M. D., Shpargel, K. B., Ospina, J. K., Tucker, K. E., and Matera, A. G. (2002). Coilin methylation regulates nuclear body formation. *Dev Cell* 3, 329-337.
- Hebert, M. D., Szymczyk, P. W., Shpargel, K. B., and Matera, A. G. (2001). Coilin forms the bridge between Cajal bodies and SMN, the spinal muscular atrophy protein. *Genes Dev* 15, 2720-2729.
- Heiss, N. S., Knight, S. W., Vulliamy, T. J., Klauck, S. M., Wiemann, S., Mason, P. J., Poustka, A., and Dokal, I. (1998). X-linked dyskeratosis congenita is caused by mutations in a highly conserved gene with putative nucleolar functions. *Nat Genet* 19, 32-38.
- Hemann, M. T., Strong, M. A., Hao, L. Y., and Greider, C. W. (2001). The shortest telomere, not average telomere length, is critical for cell viability and chromosome stability. *Cell* 107, 67-77.
- Henras, A., Dez, C., Noaillac-Depeyre, J., Henry, Y., and Caizergues-Ferrer, M. (2001). Accumulation of H/ACA snoRNPs depends on the integrity of the conserved central domain of the RNA-binding protein Nhp2p. *Nucleic Acids Res* 29, 2733-2746.
- Henras, A., Henry, Y., Bousquet-Antonelli, C., Noaillac-Depeyre, J., Gelugne, J. P., and Caizergues-Ferrer, M. (1998). Nhp2p and Nop10p are essential for the function of H/ACA snoRNPs. *Embo J* 17, 7078-7090.
- Henras, A. K., Capeyrou, R., Henry, Y., and Caizergues-Ferrer, M. (2004). Cbf5p, the putative pseudouridine synthase of H/ACA-type snoRNPs, can form a complex with Gar1p and Nop10p in absence of Nhp2p and box H/ACA snoRNAs. *Rna* 10, 1704-1712.
- Hirose, T., Shu, M. D., and Steitz, J. A. (2003). Splicing-dependent and -independent modes of assembly for intron-encoded box C/D snoRNPs in mammalian cells. *Mol Cell* 12, 113-123.
- Hirose, T., and Steitz, J. A. (2001). Position within the host intron is critical for efficient processing of box C/D snoRNAs in mammalian cells. *Proc Natl Acad Sci U S A* 98, 12914-12919.
- Ho, Y., Gruhler, A., Heilbut, A., Bader, G. D., Moore, L., Adams, S. L., Millar, A., Taylor, P., Bennett, K., Boutillier, K., *et al.* (2002). Systematic identification of protein complexes in *Saccharomyces cerevisiae* by mass spectrometry. *Nature* 415, 180-183.
- 135
- Hoareau-Aveilla, C., Bonoli, M., Caizergues-Ferrer, M., and Henry, Y. (2006). hNaf1 is

- required for accumulation of human box H/ACA snoRNPs, scaRNPs, and telomerase. *Rna*.
- Hofmann, T. G., Moller, A., Sirma, H., Zentgraf, H., Taya, Y., Droge, W., Will, H., and Schmitz, M. L. (2002). Regulation of p53 activity by its interaction with homeodomaininteracting protein kinase-2. *Nat Cell Biol* 4, 1-10.
- Holt, S. E., Aisner, D. L., Baur, J., Tesmer, V. M., Dy, M., Ouellette, M., Trager, J. B., Morin, G. B., Toft, D. O., Shay, J. W., *et al.* (1999). Functional requirement of p23 and Hsp90 in telomerase complexes. *Genes Dev* 13, 817-826.
- Huang, G. M., Jarmolowski, A., Struck, J. C., and Fournier, M. J. (1992). Accumulation of U14 small nuclear RNA in *Saccharomyces cerevisiae* requires box C, box D, and a 5', 3' terminal stem. *Mol Cell Biol* 12, 4456-4463.
- Huang, S. (2000). Review: perinucleolar structures. *J Struct Biol* 129, 233-240.
- Huang, S. (2002). Building an efficient factory: where is pre-rRNA synthesized in the nucleolus? *J Cell Biol* 157, 739-741.
- Huang, S., Deerinck, T. J., Ellisman, M. H., and Spector, D. L. (1994). In vivo analysis of the stability and transport of nuclear poly(A)+ RNA. *J Cell Biol* 126, 877-899.
- Huang, S., Deerinck, T. J., Ellisman, M. H., and Spector, D. L. (1997). The dynamic organization of the perinucleolar compartment in the cell nucleus. *J Cell Biol* 137, 965-974.
- Huang, S., and Spector, D. L. (1991). Nascent pre-mRNA transcripts are associated with nuclear regions enriched in splicing factors. *Genes Dev* 5, 2288-2302.
- Hughes, J. M., and Ares, M., Jr. (1991). Depletion of U3 small nucleolar RNA inhibits cleavage in the 5' external transcribed spacer of yeast pre-ribosomal RNA and impairs formation of 18S ribosomal RNA. *Embo J* 10, 4231-4239.
- Huttenhofer, A., Brosius, J., and Bachellerie, J. P. (2002). RNomics: identification and function of small, non-messenger RNAs. *Curr Opin Chem Biol* 6, 835-843.
- Huttenhofer, A., Kiefmann, M., Meier-Ewert, S., O'Brien, J., Lehrach, H., Bachellerie, J. P., and Brosius, J. (2001). RNomics: an experimental approach that identifies 201 candidates for novel, small, non-messenger RNAs in mouse. *Embo J* 20, 2943-2953.
- Ikura, T., Ogryzko, V. V., Grigoriev, M., Groisman, R., Wang, J., Horikoshi, M., Scully, R., Qin, J., and Nakatani, Y. (2000). Involvement of the TIP60 histone acetylase complex in DNA repair and apoptosis. *Cell* 102, 463-473.
- Isaac, C., Yang, Y., and Meier, U. T. (1998). Nopp140 functions as a molecular link between the nucleolus and the coiled bodies. *J Cell Biol* 142, 319-329.
- Ito, T., Chiba, T., Ozawa, R., Yoshida, M., Hattori, M., and Sakaki, Y. (2001). A comprehensive two-hybrid analysis to explore the yeast protein interactome. *Proc Natl Acad Sci U S A* 98, 4569-4574.
- 136
- Jackson, D. A., Hassan, A. B., Errington, R. J., and Cook, P. R. (1993). Visualization of focal sites of transcription within human nuclei. *Embo J* 12, 1059-1065.
- Jady, B. E., Bertrand, E., and Kiss, T. (2004). Human telomerase RNA and box H/ACA scaRNAs share a common Cajal body-specific localization signal. *J Cell Biol* 164, 647-652.
- Jady, B. E., Darzacq, X., Tucker, K. E., Matera, A. G., Bertrand, E., and Kiss, T. (2003). Modification of Sm small nuclear RNAs occurs in the nucleoplasmic Cajal body following import from the cytoplasm. *Embo J* 22, 1878-1888.
- Jady, B. E., and Kiss, T. (2001). A small nucleolar guide RNA functions both in 2'-O-ribose methylation and pseudouridylation of the U5 spliceosomal RNA. *Embo J* 20, 541-551.
- Jady, B. E., Richard, P., Bertrand, E., and Kiss, T. (2006). Cell Cycle-dependent Recruitment of Telomerase RNA and Cajal Bodies to Human Telomeres. *Mol Biol Cell* 17, 944-954.

- Jiang, W., Middleton, K., Yoon, H. J., Fouquet, C., and Carbon, J. (1993). An essential yeast protein, CBF5p, binds in vitro to centromeres and microtubules. *Mol Cell Biol* *13*, 4884-4893.
- Jimenez-Garcia, L. F., Segura-Valdez, M. L., Ochs, R. L., Rothblum, L. I., Hannan, R., and Spector, D. L. (1994). Nucleologenesis: U3 snRNA-containing prenucleolar bodies move to sites of active pre-rRNA transcription after mitosis. *Mol Biol Cell* *5*, 955-966.
- Jones, K. W., Gorzynski, K., Hales, C. M., Fischer, U., Badbanchi, F., Terns, R. M., and Terns, M. P. (2001). Direct interaction of the spinal muscular atrophy disease protein SMN with the small nucleolar RNA-associated protein fibrillarin. *J Biol Chem* *276*, 38645-38651.
- Kanai, Y., Dohmae, N., and Hirokawa, N. (2004). Kinesin transports RNA: isolation and characterization of an RNA-transporting granule. *Neuron* *43*, 513-525.
- Kanemaki, M., Kurokawa, Y., Matsu-ura, T., Makino, Y., Masani, A., Okazaki, K., Morishita, T., and Tamura, T. A. (1999). TIP49b, a new RuvB-like DNA helicase, is included in a complex together with another RuvB-like DNA helicase, TIP49a. *J Biol Chem* *274*, 22437-22444.
- Kass, S., Tyc, K., Steitz, J. A., and Sollner-Webb, B. (1990). The U3 small nucleolar ribonucleoprotein functions in the first step of preribosomal RNA processing. *Cell* *60*, 897-908.
- Kelleher, C., Teixeira, M. T., Forstemann, K., and Lingner, J. (2002). Telomerase: biochemical considerations for enzyme and substrate. *Trends Biochem Sci* *27*, 572-579.
- Khaitovich, P., Tenson, T., Kloss, P., and Mankin, A. S. (1999). Reconstitution of functionally active *Thermus aquaticus* large ribosomal subunits with in vitro-transcribed rRNA. *Biochemistry* *38*, 1780-1788.
- Khanna, M., Wu, H., Johansson, C., Caizergues-Ferrer, M., and Feigon, J. (2006). Structural study of the H/ACA snoRNP components Nop10p and the 3' hairpin of U65 snoRNA. *Rna* *12*, 40-52.
- 137
- Khurts, S., Masutomi, K., Delgermaa, L., Arai, K., Oishi, N., Mizuno, H., Hayashi, N., Hahn, W. C., and Murakami, S. (2004). Nucleolin interacts with telomerase. *J Biol Chem* *279*, 51508-51515.
- Kilian, A., Bowtell, D. D., Abud, H. E., Hime, G. R., Venter, D. J., Keese, P. K., Duncan, E. L., Reddel, R. R., and Jefferson, R. A. (1997). Isolation of a candidate human telomerase catalytic subunit gene, which reveals complex splicing patterns in different cell types. *Hum Mol Genet* *6*, 2011-2019.
- Kim, N. W., Piatyszek, M. A., Prowse, K. R., Harley, C. B., West, M. D., Ho, P. L., Coviello, G. M., Wright, W. E., Weinrich, S. L., and Shay, J. W. (1994). Specific association of human telomerase activity with immortal cells and cancer. *Science* *266*, 2011-2015.
- King, T. H., Decatur, W. A., Bertrand, E., Maxwell, E. S., and Fournier, M. J. (2001). A wellconnected and conserved nucleoplasmic helicase is required for production of box C/D and H/ACA snoRNAs and localization of snoRNP proteins. *Mol Cell Biol* *21*, 7731-7746.
- King, T. H., Liu, B., McCully, R. R., and Fournier, M. J. (2003). Ribosome structure and activity are altered in cells lacking snoRNPs that form pseudouridines in the peptidyl transferase center. *Mol Cell* *11*, 425-435.
- Kiseleva, E., Drummond, S. P., Goldberg, M. W., Rutherford, S. A., Allen, T. D., and Wilson, K. L. (2004). Actin- and protein-4.1-containing filaments link nuclear pore complexes to subnuclear organelles in *Xenopus* oocyte nuclei. *J Cell Sci* *117*, 2481-2490.
- Kiss-Laszlo, Z., Henry, Y., Bachellerie, J. P., Caizergues-Ferrer, M., and Kiss, T. (1996).

- Site-specific ribose methylation of preribosomal RNA: a novel function for small nucleolar RNAs. *Cell* **85**, 1077-1088.
- Kiss-Laszlo, Z., Henry, Y., and Kiss, T. (1998). Sequence and structural elements of methylation guide snoRNAs essential for site-specific ribose methylation of pre-rRNA. *Embo J* **17**, 797-807.
- Kiss, A. M., Jady, B. E., Bertrand, E., and Kiss, T. (2004). Human box H/ACA pseudouridylation guide RNA machinery. *Mol Cell Biol* **24**, 5797-5807.
- Kiss, A. M., Jady, B. E., Darzacq, X., Verheggen, C., Bertrand, E., and Kiss, T. (2002). A Cajal body-specific pseudouridylation guide RNA is composed of two box H/ACA snoRNAlike domains. *Nucleic Acids Res* **30**, 4643-4649.
- Kiss, T., Bortolin, M. L., and Filipowicz, W. (1996). Characterization of the intron-encoded U19 RNA, a new mammalian small nucleolar RNA that is not associated with fibrillarin. *Mol Cell Biol* **16**, 1391-1400.
- Kiss, T., and Filipowicz, W. (1993). Small nucleolar RNAs encoded by introns of the human cell cycle regulatory gene *RCC1*. *Embo J* **12**, 2913-2920.
- Kiss, T., and Filipowicz, W. (1995). Exonucleolytic processing of small nucleolar RNAs from pre-mRNA introns. *Genes Dev* **9**, 1411-1424.
- Kiss, T., Marshallsay, C., and Filipowicz, W. (1991). Alteration of the RNA polymerase specificity of U3 snRNA genes during evolution and in vitro. *Cell* **65**, 517-526.
- 138
- Klein, D. J., Schmeing, T. M., Moore, P. B., and Steitz, T. A. (2001). The kink-turn: a new RNA secondary structure motif. *Embo J* **20**, 4214-4221.
- Koberna, K., Malinsky, J., Pliss, A., Masata, M., Vecerova, J., Fialova, M., Bednar, J., and Raska, I. (2002). Ribosomal genes in focus: new transcripts label the dense fibrillar components and form clusters indicative of "Christmas trees" in situ. *J Cell Biol* **157**, 743-748.
- Koken, M. H., Puvion-Dutilleul, F., Guillemain, M. C., Viron, A., Linares-Cruz, G., Stuurman, N., de Jong, L., Szosteki, C., Calvo, F., Chomienne, C., and et al. (1994). The t(15;17) translocation alters a nuclear body in a retinoic acid-reversible fashion. *Embo J* **13**, 1073-1083.
- Kuhn, J. F., Tran, E. J., and Maxwell, E. S. (2002). Archaeal ribosomal protein L7 is a functional homolog of the eukaryotic 15.5kD/Snu13p snoRNP core protein. *Nucleic Acids Res* **30**, 931-941.
- Lafontaine, D. L., Bousquet-Antonelli, C., Henry, Y., Caizergues-Ferrer, M., and Tollervey, D. (1998). The box H + ACA snoRNAs carry Cbf5p, the putative rRNA pseudouridine synthase. *Genes Dev* **12**, 527-537.
- Lafontaine, D. L., and Tollervey, D. (1999). Nop58p is a common component of the box C+D snoRNPs that is required for snoRNA stability. *Rna* **5**, 455-467.
- Lafontaine, D. L., and Tollervey, D. (2000). Synthesis and assembly of the box C+D small nucleolar RNPs. *Mol Cell Biol* **20**, 2650-2659.
- Lam, Y. W., Lyon, C. E., and Lamond, A. I. (2002). Large-scale isolation of Cajal bodies from HeLa cells. *Mol Biol Cell* **13**, 2461-2473.
- Lam, Y. W., Trinkle-Mulcahy, L., and Lamond, A. I. (2005). The nucleolus. *J Cell Sci* **118**, 1335-1337.
- Lamond, A. I., and Spector, D. L. (2003). Nuclear speckles: a model for nuclear organelles. *Nat Rev Mol Cell Biol* **4**, 605-612.
- Laneve, P., Altieri, F., Fiori, M. E., Scaloni, A., Bozzoni, I., and Caffarelli, E. (2003).

- Purification, cloning, and characterization of XendoU, a novel endoribonuclease involved in processing of intron-encoded small nucleolar RNAs in *Xenopus laevis*. *J Biol Chem* *278*, 13026-13032.
- Lange, T. S., Borovjagin, A., Maxwell, E. S., and Gerbi, S. A. (1998a). Conserved boxes C and D are essential nucleolar localization elements of U14 and U8 snoRNAs. *Embo J* *17*, 3176-3187.
- Lange, T. S., Borovjagin, A. V., and Gerbi, S. A. (1998b). Nucleolar localization elements in U8 snoRNA differ from sequences required for rRNA processing. *Rna* *4*, 789-800.
- Lange, T. S., Ezrokhi, M., Amaldi, F., and Gerbi, S. A. (1999). Box H and box ACA are nucleolar localization elements of U17 small nucleolar RNA. *Mol Biol Cell* *10*, 3877-3890. 139
- Lange, T. S., and Gerbi, S. A. (2000). Transient nucleolar localization Of U6 small nuclear RNA in *Xenopus Laevis* oocytes. *Mol Biol Cell* *11*, 2419-2428.
- Lapeyre, B., Mariottini, P., Mathieu, C., Ferrer, P., Amaldi, F., Amalric, F., and Caizergues-Ferrer, M. (1990). Molecular cloning of *Xenopus* fibrillarin, a conserved U3 small nuclear ribonucleoprotein recognized by antisera from humans with autoimmune disease. *Mol Cell Biol* *10*, 430-434.
- Le, S., Sternglanz, R., and Greider, C. W. (2000). Identification of two RNA-binding proteins associated with human telomerase RNA. *Mol Biol Cell* *11*, 999-1010.
- Leader, D. J., Clark, G. P., Watters, J., Beven, A. F., Shaw, P. J., and Brown, J. W. (1997). Clusters of multiple different small nucleolar RNA genes in plants are expressed as and processed from polycistronic pre-snoRNAs. *Embo J* *16*, 5742-5751.
- Leader, D. J., Sanders, J. F., Waugh, R., Shaw, P., and Brown, J. W. (1994). Molecular characterisation of plant U14 small nucleolar RNA genes: closely linked genes are transcribed as polycistronic U14 transcripts. *Nucleic Acids Res* *22*, 5196-5203.
- Leary, D. J., Terns, M. P., and Huang, S. (2004). Components of U3 snoRNA-containing complexes shuttle between nuclei and the cytoplasm and differentially localize in nucleoli: implications for assembly and function. *Mol Biol Cell* *15*, 281-293.
- Lee, B., Matera, A. G., Ward, D. C., and Craft, J. (1996). Association of RNase mitochondrial RNA processing enzyme with ribonuclease P in higher ordered structures in the nucleolus: a possible coordinate role in ribosome biogenesis. *Proc Natl Acad Sci U S A* *93*, 11471-11476.
- Lefebvre, S., Burglen, L., Reboullet, S., Clermont, O., Burlet, P., Viollet, L., Benichou, B., Cruaud, C., Millasseau, P., Zeviani, M., and et al. (1995). Identification and characterization of a spinal muscular atrophy-determining gene. *Cell* *80*, 155-165.
- Lestrade, L., and Weber, M. J. (2006). snoRNA-LBME-db, a comprehensive database of human H/ACA and C/D box snoRNAs. *Nucleic Acids Res* *34*, D158-162.
- Leung, A. K., Gerlich, D., Miller, G., Lyon, C., Lam, Y. W., Lleres, D., Daigle, N., Zomerdijk, J., Ellenberg, J., and Lamond, A. I. (2004). Quantitative kinetic analysis of nucleolar breakdown and reassembly during mitosis in live human cells. *J Cell Biol* *166*, 787-800.
- Levy, S., Avni, D., Hariharan, N., Perry, R. P., and Meyuhas, O. (1991). Oligopyrimidine tract at the 5' end of mammalian ribosomal protein mRNAs is required for their translational control. *Proc Natl Acad Sci U S A* *88*, 3319-3323.
- Li, L., Roy, K., Katyal, S., Sun, X., Bleoo, S., and Godbout, R. (2005). Dynamic Nature of Cleavage Bodies and their Spatial Relationship to DDX1 Bodies, Cajal Bodies, and Gems. *Mol Biol Cell*.
- Liang, X. H., Xu, Y. X., and Michaeli, S. (2002). The spliced leader-associated RNA is a

trypanosome-specific sn(o) RNA that has the potential to guide pseudouridine formation on the SL RNA. *Rna* 8, 237-246.

140

Lin, J., and Blackburn, E. H. (2004). Nucleolar protein PinX1p regulates telomerase by sequestering its protein catalytic subunit in an inactive complex lacking telomerase RNA. *Genes Dev* 18, 387-396.

Lingner, J., and Cech, T. R. (1996). Purification of telomerase from *Euplotes aediculatus*: requirement of a primer 3' overhang. *Proc Natl Acad Sci U S A* 93, 10712-10717.

Lingner, J., Hughes, T. R., Shevchenko, A., Mann, M., Lundblad, V., and Cech, T. R. (1997). Reverse transcriptase motifs in the catalytic subunit of telomerase. *Science* 276, 561-567.

Liu, J., Hebert, M. D., Ye, Y., Templeton, D. J., Kung, H., and Matera, A. G. (2000). Cell cycle-dependent localization of the CDK2-cyclin E complex in Cajal (coiled) bodies. *J Cell Sci* 113 (Pt 9), 1543-1552.

Liu, J. L., Murphy, C., Buszczak, M., Clatterbuck, S., Goodman, R., and Gall, J. G. (2006). The *Drosophila melanogaster* Cajal body. *J Cell Biol* 172, 875-884.

Liu, Q., and Dreyfuss, G. (1996). A novel nuclear structure containing the survival of motor neurons protein. *Embo J* 15, 3555-3565.

Liu, Q., Fischer, U., Wang, F., and Dreyfuss, G. (1997). The spinal muscular atrophy disease gene product, SMN, and its associated protein SIP1 are in a complex with spliceosomal snRNP proteins. *Cell* 90, 1013-1021.

Lowe, T. M., and Eddy, S. R. (1999). A computational screen for methylation guide snoRNAs in yeast. *Science* 283, 1168-1171.

Lukowiak, A. A., Narayanan, A., Li, Z. H., Terns, R. M., and Terns, M. P. (2001). The snoRNA domain of vertebrate telomerase RNA functions to localize the RNA within the nucleus. *Rna* 7, 1833-1844.

Ly, H., Xu, L., Rivera, M. A., Parslow, T. G., and Blackburn, E. H. (2003). A role for a novel 'trans-pseudoknot' RNA-RNA interaction in the functional dimerization of human telomerase. *Genes Dev* 17, 1078-1083.

Lyman, S. K., Gerace, L., and Baserga, S. J. (1999). Human Nop5/Nop58 is a component common to the box C/D small nucleolar ribonucleoproteins. *Rna* 5, 1597-1604.

Ma, T., Van Tine, B. A., Wei, Y., Garrett, M. D., Nelson, D., Adams, P. D., Wang, J., Qin, J., Chow, L. T., and Harper, J. W. (2000). Cell cycle-regulated phosphorylation of p220(NPAT) by cyclin E/Cdk2 in Cajal bodies promotes histone gene transcription. *Genes Dev* 14, 2298-2313.

Ma, X., Yang, C., Alexandrov, A., Grayhack, E. J., Behm-Ansmant, I., and Yu, Y. T. (2005). Pseudouridylation of yeast U2 snRNA is catalyzed by either an RNA-guided or RNA-independent mechanism. *Embo J* 24, 2403-2413.

Ma, X., Zhao, X., and Yu, Y. T. (2003). Pseudouridylation (Psi) of U2 snRNA in *S. cerevisiae* is catalyzed by an RNA-independent mechanism. *Embo J* 22, 1889-1897.

Maden, B. E. (1990). The numerous modified nucleotides in eukaryotic ribosomal RNA. *Prog Nucleic Acid Res Mol Biol* 39, 241-303.

Manival, X., Charron, C., Fourmann, J. B., Godard, F., Charpentier, B., and Branlant, C. (2006). Crystal structure determination and site-directed mutagenesis of the *Pyrococcus abyssi* aCBF5-aNOP10 complex reveal crucial roles of the C-terminal domains of both proteins in H/ACA sRNP activity. *Nucleic Acids Res* 34, 826-839.

Marcello, A., Ferrari, A., Pellegrini, V., Pegoraro, G., Lusic, M., Beltram, F., and Giacca, M. (2003). Recruitment of human cyclin T1 to nuclear bodies through direct interaction with the

PML protein. *Embo J* 22, 2156-2166.

Marrone, A., Stevens, D., Vulliamy, T., Dokal, I., and Mason, P. J. (2004). Heterozygous telomerase RNA mutations found in dyskeratosis congenita and aplastic anemia reduce telomerase activity via haploinsufficiency. *Blood* 104, 3936-3942.

Martin-Rivera, L., and Blasco, M. A. (2001). Identification of functional domains and dominant negative mutations in vertebrate telomerase RNA using an in vivo reconstitution system. *J Biol Chem* 276, 5856-5865.

Massenet, S., Motorin, Y., Lafontaine, D. L., Hurt, E. C., Grosjean, H., and Branlant, C. (1999). Pseudouridine mapping in the *Saccharomyces cerevisiae* spliceosomal U small nuclear RNAs (snRNAs) reveals that pseudouridine synthase *pus1p* exhibits a dual substrate specificity for U2 snRNA and tRNA. *Mol Cell Biol* 19, 2142-2154.

Massenet, S., Pellizzoni, L., Paushkin, S., Mattaj, I. W., and Dreyfuss, G. (2002). The SMN complex is associated with snRNPs throughout their cytoplasmic assembly pathway. *Mol Cell Biol* 22, 6533-6541.

Masutomi, K., Yu, E. Y., Khurts, S., Ben-Porath, I., Currier, J. L., Metz, G. B., Brooks, M. W., Kaneko, S., Murakami, S., DeCaprio, J. A., *et al.* (2003). Telomerase maintains telomere structure in normal human cells. *Cell* 114, 241-253.

Matera, A. G., and Frey, M. R. (1998). Coiled bodies and gems: Janus or gemini? *Am J Hum Genet* 63, 317-321.

Matera, A. G., Frey, M. R., Margelot, K., and Wolin, S. L. (1995). A perinucleolar compartment contains several RNA polymerase III transcripts as well as the polypyrimidine tract-binding protein, hnRNPI. *J Cell Biol* 129, 1181-1193.

Matera, A. G., and Ward, D. C. (1993). Nucleoplasmic organization of small nuclear ribonucleoproteins in cultured human cells. *J Cell Biol* 121, 715-727.

Maul, G. G. (1998). Nuclear domain 10, the site of DNA virus transcription and replication. *Bioessays* 20, 660-667.

Meier, U. T., and Blobel, G. (1992). Nopp140 shuttles on tracks between nucleolus and cytoplasm. *Cell* 70, 127-138.

Meier, U. T., and Blobel, G. (1994). NAP57, a mammalian nucleolar protein with a putative homolog in yeast and bacteria. *J Cell Biol* 127, 1505-1514.

Meister, G., Eggert, C., and Fischer, U. (2002). SMN-mediated assembly of RNPs: a complex story. *Trends Cell Biol* 12, 472-478.

142

Mekhail, K., Gunaratnam, L., Bonicalzi, M. E., and Lee, S. (2004). HIF activation by pHdependent nucleolar sequestration of VHL. *Nat Cell Biol* 6, 642-647.

Meyerson, M., Counter, C. M., Eaton, E. N., Ellisen, L. W., Steiner, P., Caddle, S. D., Ziaugra, L., Beijersbergen, R. L., Davidoff, M. J., Liu, Q., *et al.* (1997). hEST2, the putative human telomerase catalytic subunit gene, is up-regulated in tumor cells and during immortalization. *Cell* 90, 785-795.

Michienzi, A., Li, S., Zaia, J. A., and Rossi, J. J. (2002). A nucleolar TAR decoy inhibitor of HIV-1 replication. *Proc Natl Acad Sci U S A* 99, 14047-14052.

Mintz, P. J., Patterson, S. D., Neuwald, A. F., Spahr, C. S., and Spector, D. L. (1999). Purification and biochemical characterization of interchromatin granule clusters. *Embo J* 18, 4308-4320.

Mishra, R. K., and Eliceiri, G. L. (1997). Three small nucleolar RNAs that are involved in ribosomal RNA precursor processing. *Proc Natl Acad Sci U S A* 94, 4972-4977.

- Misteli, T. (2001). Protein dynamics: implications for nuclear architecture and gene expression. *Science* 291, 843-847.
- Misteli, T., Caceres, J. F., and Spector, D. L. (1997). The dynamics of a pre-mRNA splicing factor in living cells. *Nature* 387, 523-527.
- Mitchell, J. R., Cheng, J., and Collins, K. (1999a). A box H/ACA small nucleolar RNA-like domain at the human telomerase RNA 3' end. *Mol Cell Biol* 19, 567-576.
- Mitchell, J. R., and Collins, K. (2000). Human telomerase activation requires two independent interactions between telomerase RNA and telomerase reverse transcriptase. *Mol Cell* 6, 361-371.
- Mitchell, J. R., Wood, E., and Collins, K. (1999b). A telomerase component is defective in the human disease dyskeratosis congenita. *Nature* 402, 551-555.
- Mochizuki, Y., He, J., Kulkarni, S., Bessler, M., and Mason, P. J. (2004). Mouse dyskerin mutations affect accumulation of telomerase RNA and small nucleolar RNA, telomerase activity, and ribosomal RNA processing. *Proc Natl Acad Sci U S A* 101, 10756-10761.
- Morgan, G. T., Doyle, O., Murphy, C., and Gall, J. G. (2000). RNA polymerase II in Cajal bodies of amphibian oocytes. *J Struct Biol* 129, 258-268.
- Moriarty, T. J., Huard, S., Dupuis, S., and Autexier, C. (2002). Functional multimerization of human telomerase requires an RNA interaction domain in the N terminus of the catalytic subunit. *Mol Cell Biol* 22, 1253-1265.
- Morlando, M., Ballarino, M., Greco, P., Caffarelli, E., Dichtl, B., and Bozzoni, I. (2004). Coupling between snoRNP assembly and 3' processing controls box C/D snoRNA biosynthesis in yeast. *Embo J* 23, 2392-2401.
- Morrissey, J. P., and Tollervey, D. (1993). Yeast snR30 is a small nucleolar RNA required for 18S rRNA synthesis. *Mol Cell Biol* 13, 2469-2477.
- 143
- Mouaikel, J., Narayanan, U., Verheggen, C., Matera, A. G., Bertrand, E., Tazi, J., and Bordonne, R. (2003). Interaction between the small-nuclear-RNA cap hypermethylase and the spinal muscular atrophy protein, survival of motor neuron. *EMBO Rep* 4, 616-622.
- Mouaikel, J., Verheggen, C., Bertrand, E., Tazi, J., and Bordonne, R. (2002). Hypermethylation of the cap structure of both yeast snRNAs and snoRNAs requires a conserved methyltransferase that is localized to the nucleolus. *Mol Cell* 9, 891-901.
- Muratani, M., Gerlich, D., Janicki, S. M., Gebhard, M., Eils, R., and Spector, D. L. (2002). Metabolic-energy-dependent movement of PML bodies within the mammalian cell nucleus. *Nat Cell Biol* 4, 106-110.
- Nakamura, T. M., Morin, G. B., Chapman, K. B., Weinrich, S. L., Andrews, W. H., Lingner, J., Harley, C. B., and Cech, T. R. (1997). Telomerase catalytic subunit homologs from fission yeast and human. *Science* 277, 955-959.
- Narayanan, A., Lukowiak, A., Jady, B. E., Dragon, F., Kiss, T., Terns, R. M., and Terns, M. P. (1999a). Nucleolar localization signals of box H/ACA small nucleolar RNAs. *Embo J* 18, 5120-5130.
- Narayanan, A., Speckmann, W., Terns, R., and Terns, M. P. (1999b). Role of the box C/D motif in localization of small nucleolar RNAs to coiled bodies and nucleoli. *Mol Biol Cell* 10, 2131-2147.
- Narayanan, U., Achsel, T., Luhrmann, R., and Matera, A. G. (2004). Coupled in vitro import of U snRNPs and SMN, the spinal muscular atrophy protein. *Mol Cell* 16, 223-234.
- Narayanan, U., Ospina, J. K., Frey, M. R., Hebert, M. D., and Matera, A. G. (2002). SMN, the spinal muscular atrophy protein, forms a pre-import snRNP complex with snurportin1 and

- importin beta. *Hum Mol Genet* *11*, 1785-1795.
- Nesic, D., Tanackovic, G., and Kramer, A. (2004). A role for Cajal bodies in the final steps of U2 snRNP biogenesis. *J Cell Sci* *117*, 4423-4433.
- Newman, D. R., Kuhn, J. F., Shanab, G. M., and Maxwell, E. S. (2000). Box C/D snoRNA-associated proteins: two pairs of evolutionarily ancient proteins and possible links to replication and transcription. *Rna* *6*, 861-879.
- Nikitina, T., and Woodcock, C. L. (2004). Closed chromatin loops at the ends of chromosomes. *J Cell Biol* *166*, 161-165.
- O'Keefe, R. T., Mayeda, A., Sadowski, C. L., Krainer, A. R., and Spector, D. L. (1994). Disruption of pre-mRNA splicing in vivo results in reorganization of splicing factors. *J Cell Biol* *124*, 249-260.
- Ochs, R. L., Stein, T. W., Jr., and Tan, E. M. (1994). Coiled bodies in the nucleolus of breast cancer cells. *J Cell Sci* *107 (Pt 2)*, 385-399.
- Ofengand, J. (2002). Ribosomal RNA pseudouridines and pseudouridine synthases. *FEBS Lett* *514*, 17-25.
- 144
- Olson, M. O. (2004). Sensing cellular stress: another new function for the nucleolus? *Sci STKE* *2004*, pe10.
- Olson, M. O., Dundr, M., and Szebeni, A. (2000). The nucleolus: an old factory with unexpected capabilities. *Trends Cell Biol* *10*, 189-196.
- Olson, M. O., Hingorani, K., and Szebeni, A. (2002). Conventional and nonconventional roles of the nucleolus. *Int Rev Cytol* *219*, 199-266.
- Omer, A. D., Lowe, T. M., Russell, A. G., Ebhardt, H., Eddy, S. R., and Dennis, P. P. (2000). Homologs of small nucleolar RNAs in Archaea. *Science* *288*, 517-522.
- Omer, A. D., Ziesche, S., Ebhardt, H., and Dennis, P. P. (2002). In vitro reconstitution and activity of a C/D box methylation guide ribonucleoprotein complex. *Proc Natl Acad Sci U S A* *99*, 5289-5294.
- Ooi, S. L., Samarsky, D. A., Fournier, M. J., and Boeke, J. D. (1998). Intronic snoRNA biosynthesis in *Saccharomyces cerevisiae* depends on the lariat-debranching enzyme: intron length effects and activity of a precursor snoRNA. *Rna* *4*, 1096-1110.
- Patton, J. R., and Padgett, R. W. (2005). Pseudouridine modification in *Caenorhabditis elegans* spliceosomal snRNAs: unique modifications are found in regions involved in snRNA-snRNA interactions. *BMC Mol Biol* *6*, 20.
- Paushkin, S., Gubitz, A. K., Massenet, S., and Dreyfuss, G. (2002). The SMN complex, an assemblyosome of ribonucleoproteins. *Curr Opin Cell Biol* *14*, 305-312.
- Paushkin, S. V., Patel, M., Furia, B. S., Peltz, S. W., and Trotta, C. R. (2004). Identification of a human endonuclease complex reveals a link between tRNA splicing and pre-mRNA 3' end formation. *Cell* *117*, 311-321.
- Peculis, B. A. (1997). The sequence of the 5' end of the U8 small nucleolar RNA is critical for 5.8S and 28S rRNA maturation. *Mol Cell Biol* *17*, 3702-3713.
- Peculis, B. A., and Steitz, J. A. (1993). Disruption of U8 nucleolar snRNA inhibits 5.8S and 28S rRNA processing in the *Xenopus* oocyte. *Cell* *73*, 1233-1245.
- Pederson, T. (1998). The plurifunctional nucleolus. *Nucleic Acids Res* *26*, 3871-3876.
- Pellizzoni, L., Baccon, J., Charroux, B., and Dreyfuss, G. (2001a). The survival of motor neurons (SMN) protein interacts with the snoRNP proteins fibrillarin and GAR1. *Curr Biol*

11, 1079-1088.

Pellizzoni, L., Charroux, B., Rappalber, J., Mann, M., and Dreyfuss, G. (2001b). A functional interaction between the survival motor neuron complex and RNA polymerase II. *J Cell Biol* 152, 75-85.

Pellizzoni, L., Kataoka, N., Charroux, B., and Dreyfuss, G. (1998). A novel function for SMN, the spinal muscular atrophy disease gene product, in pre-mRNA splicing. *Cell* 95, 615-624.

145

Pellizzoni, L., Yong, J., and Dreyfuss, G. (2002). Essential role for the SMN complex in the specificity of snRNP assembly. *Science* 298, 1775-1779.

Pendle, A. F., Clark, G. P., Boon, R., Lewandowska, D., Lam, Y. W., Andersen, J., Mann, M., Lamond, A. I., Brown, J. W., and Shaw, P. J. (2005). Proteomic analysis of the Arabidopsis nucleolus suggests novel nucleolar functions. *Mol Biol Cell* 16, 260-269.

Petfalski, E., Dandekar, T., Henry, Y., and Tollervey, D. (1998). Processing of the precursors to small nucleolar RNAs and rRNAs requires common components. *Mol Cell Biol* 18, 1181-1189.

Phair, R. D., and Misteli, T. (2000). High mobility of proteins in the mammalian cell nucleus. *Nature* 404, 604-609.

Phatnani, H. P., Jones, J. C., and Greenleaf, A. L. (2004). Expanding the functional repertoire of CTD kinase I and RNA polymerase II: novel phosphoCTD-associating proteins in the yeast proteome. *Biochemistry* 43, 15702-15719.

Pillai, R. S., Will, C. L., Luhrmann, R., Schumperli, D., and Muller, B. (2001). Purified U7 snRNPs lack the Sm proteins D1 and D2 but contain Lsm10, a new 14 kDa Sm D1-like protein. *Embo J* 20, 5470-5479.

Platani, M., Goldberg, I., Lamond, A. I., and Swedlow, J. R. (2002). Cajal body dynamics and association with chromatin are ATP-dependent. *Nat Cell Biol* 4, 502-508.

Platani, M., Goldberg, I., Swedlow, J. R., and Lamond, A. I. (2000). In vivo analysis of Cajal body movement, separation, and joining in live human cells. *J Cell Biol* 151, 1561-1574.

Pogacic, V., Dragon, F., and Filipowicz, W. (2000). Human H/ACA small nucleolar RNPs and telomerase share evolutionarily conserved proteins NHP2 and NOP10. *Mol Cell Biol* 20, 9028-9040.

Politz, J. C., Lewandowski, L. B., and Pederson, T. (2002). Signal recognition particle RNA localization within the nucleolus differs from the classical sites of ribosome synthesis. *J Cell Biol* 159, 411-418.

Politz, J. C., Polena, I., Trask, I., Bazett-Jones, D. P., and Pederson, T. (2005). A nonribosomal landscape in the nucleolus revealed by the stem cell protein nucleostemin. *Mol Biol Cell* 16, 3401-3410.

Politz, J. C., Tuft, R. A., Pederson, T., and Singer, R. H. (1999). Movement of nuclear poly(A) RNA throughout the interchromatin space in living cells. *Curr Biol* 9, 285-291.

Politz, J. C., Yarovoi, S., Kilroy, S. M., Gowda, K., Zwieb, C., and Pederson, T. (2000). Signal recognition particle components in the nucleolus. *Proc Natl Acad Sci U S A* 97, 55-60.

Prasanth, K. V., Prasanth, S. G., Xuan, Z., Hearn, S., Freier, S. M., Bennett, C. F., Zhang, M. Q., and Spector, D. L. (2005). Regulating gene expression through RNA nuclear retention. *Cell* 123, 249-263.

146

Prisley, S., Michienzi, A., Presutti, C., Fragapane, P., and Bozzoni, I. (1993). Two different snoRNAs are encoded in introns of amphibian and human L1 ribosomal protein genes.

Nucleic Acids Res 21, 5824-5830.

Qu, L. H., Henras, A., Lu, Y. J., Zhou, H., Zhou, W. X., Zhu, Y. Q., Zhao, J., Henry, Y., Caizergues-Ferrer, M., and Bachellerie, J. P. (1999). Seven novel methylation guide small nucleolar RNAs are processed from a common polycistronic transcript by Rat1p and RNase III in yeast. *Mol Cell Biol* 19, 1144-1158.

Qu, L. H., Meng, Q., Zhou, H., and Chen, Y. Q. (2001). Identification of 10 novel snoRNA gene clusters from *Arabidopsis thaliana*. *Nucleic Acids Res* 29, 1623-1630.

Quignon, F., De Bels, F., Koken, M., Feunteun, J., Ameisen, J. C., and de The, H. (1998). PML induces a novel caspase-independent death process. *Nat Genet* 20, 259-265.

Rashid, R., Aittaleb, M., Chen, Q., Spiegel, K., Demeler, B., and Li, H. (2003). Functional requirement for symmetric assembly of archaeal box C/D small ribonucleoprotein particles. *J Mol Biol* 333, 295-306.

Rashid, R., Liang, B., Baker, D. L., Youssef, O. A., He, Y., Phipps, K., Terns, R. M., Terns, M. P., and Li, H. (2006). Crystal structure of a Cbf5-Nop10-Gar1 complex and implications in RNA-guided pseudouridylation and dyskeratosis congenita. *Mol Cell* 21, 249-260.

Raska, I., Andrade, L. E., Ochs, R. L., Chan, E. K., Chang, C. M., Roos, G., and Tan, E. M. (1991). Immunological and ultrastructural studies of the nuclear coiled body with autoimmune antibodies. *Exp Cell Res* 195, 27-37.

Raska, I., Koberna, K., Malinsky, J., Fidlerova, H., and Masata, M. (2004). The nucleolus and transcription of ribosomal genes. *Biol Cell* 96, 579-594.

Raychaudhuri, S., Conrad, J., Hall, B. G., and Ofengand, J. (1998). A pseudouridine synthase required for the formation of two universally conserved pseudouridines in ribosomal RNA is essential for normal growth of *Escherichia coli*. *Rna* 4, 1407-1417.

Reddy, T. R., Xu, W., Mau, J. K., Goodwin, C. D., Suhasini, M., Tang, H., Frimpong, K., Rose, D. W., and Wong-Staal, F. (1999). Inhibition of HIV replication by dominant negative mutants of Sam68, a functional homolog of HIV-1 Rev. *Nat Med* 5, 635-642.

Renalier, M. H., Joseph, N., Gaspin, C., Thebault, P., and Mouglin, A. (2005). The Cm56 tRNA modification in archaea is catalyzed either by a specific 2'-O-methylase, or a C/D sRNP. *Rna* 11, 1051-1063.

Richard, P., Darzacq, X., Bertrand, E., Jady, B. E., Verheggen, C., and Kiss, T. (2003). A common sequence motif determines the Cajal body-specific localization of box H/ACA scaRNAs. *Embo J* 22, 4283-4293.

Richard, P., Kiss, A. M., Darzacq, X., and Kiss, T. (2006). Cotranscriptional recognition of human intronic box H/ACA snoRNAs occurs in a splicing-independent manner. *Mol Cell Biol* 26, 2540-2549.

Rodway, H., Llanos, S., Rowe, J., and Peters, G. (2004). Stability of nucleolar versus nonnucleolar

forms of human p14(ARF). *Oncogene* 23, 6186-6192.

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Rozhdestvensky, T. S., Tang, T. H., Tchirkova, I. V., Brosius, J., Bachellerie, J. P., and Huttenhofer, A. (2003). Binding of L7Ae protein to the K-turn of archaeal snoRNAs: a shared RNA binding motif for C/D and H/ACA box snoRNAs in Archaea. *Nucleic Acids Res* 31, 869-877.

Rubbi, C. P., and Milner, J. (2003). Disruption of the nucleolus mediates stabilization of p53 in response to DNA damage and other stresses. *Embo J* 22, 6068-6077.

Rudolph, K. L., Millard, M., Bosenberg, M. W., and DePinho, R. A. (2001). Telomere dysfunction and evolution of intestinal carcinoma in mice and humans. *Nat Genet* 28, 155-

- Ruggero, D., Grisendi, S., Piazza, F., Rego, E., Mari, F., Rao, P. H., Cordon-Cardo, C., and Pandolfi, P. P. (2003). Dyskeratosis congenita and cancer in mice deficient in ribosomal RNA modification. *Science* 299, 259-262.
- Ruggero, D., Wang, Z. G., and Pandolfi, P. P. (2000). The puzzling multiple lives of PML and its role in the genesis of cancer. *Bioessays* 22, 827-835.
- Saez-Vasquez, J., Caparros-Ruiz, D., Barneche, F., and Echeverria, M. (2004). A plant snoRNP complex containing snoRNAs, fibrillarin, and nucleolin-like proteins is competent for both rRNA gene binding and pre-rRNA processing in vitro. *Mol Cell Biol* 24, 7284-7297.
- Saitoh, N., Spahr, C. S., Patterson, S. D., Bubulya, P., Neuwald, A. F., and Spector, D. L. (2004). Proteomic analysis of interchromatin granule clusters. *Mol Biol Cell* 15, 3876-3890.
- Samarsky, D. A., and Fournier, M. J. (1999). A comprehensive database for the small nucleolar RNAs from *Saccharomyces cerevisiae*. *Nucleic Acids Res* 27, 161-164.
- Samarsky, D. A., Fournier, M. J., Singer, R. H., and Bertrand, E. (1998). The snoRNA box C/D motif directs nucleolar targeting and also couples snoRNA synthesis and localization. *Embo J* 17, 3747-3757.
- Sansam, C. L., Wells, K. S., and Emeson, R. B. (2003). Modulation of RNA editing by functional nucleolar sequestration of ADAR2. *Proc Natl Acad Sci U S A* 100, 14018-14023.
- Savino, R., and Gerbi, S. A. (1990). In vivo disruption of *Xenopus* U3 snRNA affects ribosomal RNA processing. *Embo J* 9, 2299-2308.
- Schaffert, N., Hossbach, M., Heintzmann, R., Achsel, T., and Luhrmann, R. (2004). RNAi knockdown of hPrp31 leads to an accumulation of U4/U6 di-snRNPs in Cajal bodies. *Embo J* 23, 3000-3009.
- Schattner, P., Barberan-Soler, S., and Lowe, T. M. (2006). A computational screen for mammalian pseudouridylation guide H/ACA RNAs. *Rna* 12, 15-25.
- Schattner, P., Decatur, W. A., Davis, C. A., Ares, M., Jr., Fournier, M. J., and Lowe, T. M. (2004). Genome-wide searching for pseudouridylation guide snoRNAs: analysis of the *Saccharomyces cerevisiae* genome. *Nucleic Acids Res* 32, 4281-4296.
- Schul, W., Groenhout, B., Koberna, K., Takagaki, Y., Jenny, A., Manders, E. M., Raska, I., van Driel, R., and de Jong, L. (1996). The RNA 3' cleavage factors CstF 64 kDa and CPSF 148 100 kDa are concentrated in nuclear domains closely associated with coiled bodies and newly synthesized RNA. *Embo J* 15, 2883-2892.
- Schul, W., van Der Kraan, I., Matera, A. G., van Driel, R., and de Jong, L. (1999). Nuclear domains enriched in RNA 3'-processing factors associate with coiled bodies and histone genes in a cell cycle-dependent manner. *Mol Biol Cell* 10, 3815-3824.
- Schul, W., van Driel, R., and de Jong, L. (1998). A subset of poly(A) polymerase is concentrated at sites of RNA synthesis and is associated with domains enriched in splicing factors and poly(A) RNA. *Exp Cell Res* 238, 1-12.
- Seimiya, H., Sawada, H., Muramatsu, Y., Shimizu, M., Ohko, K., Yamane, K., and Tsuruo, T. (2000). Involvement of 14-3-3 proteins in nuclear localization of telomerase. *Embo J* 19, 2652-2661.
- Shav-Tal, Y., Darzacq, X., Shenoy, S. M., Fusco, D., Janicki, S. M., Spector, D. L., and Singer, R. H. (2004). Dynamics of single mRNPs in nuclei of living cells. *Science* 304, 1797-1800.
- Shaw, P. J., and Brown, J. W. (2004). Plant nuclear bodies. *Curr Opin Plant Biol* 7, 614-620.
- Shen, X., Mizuguchi, G., Hamiche, A., and Wu, C. (2000). A chromatin remodelling complex

involved in transcription and DNA processing. *Nature* *406*, 541-544.

Shpargel, K. B., and Matera, A. G. (2005). Gemin proteins are required for efficient assembly of Sm-class ribonucleoproteins. *Proc Natl Acad Sci U S A* *102*, 17372-17377.

Shpargel, K. B., Ospina, J. K., Tucker, K. E., Matera, A. G., and Hebert, M. D. (2003). Control of Cajal body number is mediated by the coilin C-terminus. *J Cell Sci* *116*, 303-312.

Skare, P., Kreivi, J. P., Bergstrom, A., and Karlsson, R. (2003). Profilin I colocalizes with speckles and Cajal bodies: a possible role in pre-mRNA splicing. *Exp Cell Res* *286*, 12-21.

Sleeman, J. E., Ajuh, P., and Lamond, A. I. (2001). snRNP protein expression enhances the formation of Cajal bodies containing p80-coilin and SMN. *J Cell Sci* *114*, 4407-4419.

Sleeman, J. E., and Lamond, A. I. (1999). Newly assembled snRNPs associate with coiled bodies before speckles, suggesting a nuclear snRNP maturation pathway. *Curr Biol* *9*, 1065-1074.

Sleeman, J. E., Trinkle-Mulcahy, L., Prescott, A. R., Ogg, S. C., and Lamond, A. I. (2003). Cajal body proteins SMN and Coilin show differential dynamic behaviour in vivo. *J Cell Sci* *116*, 2039-2050.

Smith, A. J., Ling, Y., and Morgan, G. T. (2003). Subnuclear localization and Cajal body targeting of transcription elongation factor TFIIS in amphibian oocytes. *Mol Biol Cell* *14*, 1255-1267.

Smith, C. M., and Steitz, J. A. (1998). Classification of gas5 as a multi-small-nucleolar-RNA (snoRNA) host gene and a member of the 5'-terminal oligopyrimidine gene family reveals common features of snoRNA host genes. *Mol Cell Biol* *18*, 6897-6909.

149

Smith, K. P., and Lawrence, J. B. (2000). Interactions of U2 gene loci and their nuclear transcripts with Cajal (coiled) bodies: evidence for PreU2 within Cajal bodies. *Mol Biol Cell* *11*, 2987-2998.

Sommerville, J., Brumwell, C. L., Politz, J. C., and Pederson, T. (2005). Signal recognition particle assembly in relation to the function of amplified nucleoli of *Xenopus* oocytes. *J Cell Sci* *118*, 1299-1307.

Speckmann, W., Narayanan, A., Terns, R., and Terns, M. P. (1999). Nuclear retention elements of U3 small nucleolar RNA. *Mol Cell Biol* *19*, 8412-8421.

Stanek, D., and Neugebauer, K. M. (2004). Detection of snRNP assembly intermediates in Cajal bodies by fluorescence resonance energy transfer. *J Cell Biol* *166*, 1015-1025.

Stanek, D., and Neugebauer, K. M. (2006). The Cajal body: a meeting place for spliceosomal snRNPs in the nuclear maze. *Chromosoma*.

Stanek, D., Rader, S. D., Klingauf, M., and Neugebauer, K. M. (2003). Targeting of U4/U6 small nuclear RNP assembly factor SART3/p110 to Cajal bodies. *J Cell Biol* *160*, 505-516.

Steinmetz, E. J., Conrad, N. K., Brow, D. A., and Corden, J. L. (2001). RNA-binding protein Nrd1 directs poly(A)-independent 3'-end formation of RNA polymerase II transcripts. *Nature* *413*, 327-331.

Stevens, S. W., Ryan, D. E., Ge, H. Y., Moore, R. E., Young, M. K., Lee, T. D., and Abelson, J. (2002). Composition and functional characterization of the yeast spliceosomal pentasRNP. *Mol Cell* *9*, 31-44.

Szewczak, L. B., DeGregorio, S. J., Strobel, S. A., and Steitz, J. A. (2002). Exclusive interaction of the 15.5 kD protein with the terminal box C/D motif of a methylation guide snoRNP. *Chem Biol* *9*, 1095-1107.

Szewczak, L. B., Gabrielsen, J. S., Degregorio, S. J., Strobel, S. A., and Steitz, J. A. (2005). Molecular basis for RNA kink-turn recognition by the h15.5K small RNP protein. *Rna* *11*,

1407-1419.

Szkukalek, A., Myslinski, E., Mouglin, A., Luhrmann, R., and Branlant, C. (1995). Phylogenetic conservation of modified nucleotides in the terminal loop 1 of the spliceosomal U5 snRNA. *Biochimie* 77, 16-21.

Tang, T. H., Rozhddestvensky, T. S., d'Orval, B. C., Bortolin, M. L., Huber, H., Charpentier, B., Branlant, C., Bachellerie, J. P., Brosius, J., and Huttenhofer, A. (2002). RNomics in Archaea reveals a further link between splicing of archaeal introns and rRNA processing. *Nucleic Acids Res* 30, 921-930.

Teixeira, M. T., Arneric, M., Sperisen, P., and Lingner, J. (2004). Telomere length homeostasis is achieved via a switch between telomerase- extendible and -nonextendible states. *Cell* 117, 323-335.

Teixeira, M. T., Forstemann, K., Gasser, S. M., and Lingner, J. (2002). Intracellular trafficking of yeast telomerase components. *EMBO Rep* 3, 652-659.

150

Terns, M. P., and Terns, R. M. (2001). Macromolecular complexes: SMN--the master assembler. *Curr Biol* 11, R862-864.

Terns, M. P., and Terns, R. M. (2002). Small nucleolar RNAs: versatile trans-acting molecules of ancient evolutionary origin. *Gene Expr* 10, 17-39.

Theimer, C. A., Finger, L. D., Trantirek, L., and Feigon, J. (2003). Mutations linked to dyskeratosis congenita cause changes in the structural equilibrium in telomerase RNA. *Proc Natl Acad Sci U S A* 100, 449-454.

Thiry, M. (1995). The interchromatin granules. *Histol Histopathol* 10, 1035-1045.

Thompson, M., Haeusler, R. A., Good, P. D., and Engelke, D. R. (2003). Nucleolar clustering of dispersed tRNA genes. *Science* 302, 1399-1401.

Ting, N. S., Yu, Y., Pohorelic, B., Lees-Miller, S. P., and Beattie, T. L. (2005). Human Ku70/80 interacts directly with hTR, the RNA component of human telomerase. *Nucleic Acids Res* 33, 2090-2098.

Tollervey, D., Lehtonen, H., Jansen, R., Kern, H., and Hurt, E. C. (1993). Temperature-sensitive mutations demonstrate roles for yeast fibrillarin in pre-rRNA processing, pre-rRNA methylation, and ribosome assembly. *Cell* 72, 443-457.

Tomlinson, R. L., Ziegler, T. D., Supakorndej, T., Terns, R. M., and Terns, M. P. (2006). Cell Cycle-regulated Trafficking of Human Telomerase to Telomeres. *Mol Biol Cell* 17, 955-965.

Torchet, C., Badis, G., Devaux, F., Costanzo, G., Werner, M., and Jacquier, A. (2005). The complete set of H/ACA snoRNAs that guide rRNA pseudouridylations in *Saccharomyces cerevisiae*. *Rna* 11, 928-938.

Tran, E. J., Zhang, X., and Maxwell, E. S. (2003). Efficient RNA 2'-O-methylation requires juxtaposed and symmetrically assembled archaeal box C/D and C'/D' RNPs. *Embo J* 22, 3930-3940.

Tremblay, A., Lamontagne, B., Catala, M., Yam, Y., Larose, S., Good, L., and Elela, S. A. (2002). A physical interaction between Gar1p and Rnt1 pi is required for the nuclear import of H/ACA small nucleolar RNA-associated proteins. *Mol Cell Biol* 22, 4792-4802.

Tucker, K. E., Berciano, M. T., Jacobs, E. Y., LePage, D. F., Shpargel, K. B., Rossire, J. J., Chan, E. K., Lafarga, M., Conlon, R. A., and Matera, A. G. (2001). Residual Cajal bodies in coilin knockout mice fail to recruit Sm snRNPs and SMN, the spinal muscular atrophy gene product. *J Cell Biol* 154, 293-307.

Tuma, R. S., and Roth, M. B. (1999). Induction of coiled body-like structures in *Xenopus* oocytes by U7 snRNA. *Chromosoma* 108, 337-344.

Tycowski, K. T., Aab, A., and Steitz, J. A. (2004). Guide RNAs with 5' caps and novel box C/D snoRNA-like domains for modification of snRNAs in metazoa. *Curr Biol* *14*, 1985-1995.

Tycowski, K. T., Shu, M. D., and Steitz, J. A. (1994). Requirement for intron-encoded U22 small nucleolar RNA in 18S ribosomal RNA maturation. *Science* *266*, 1558-1561.

151

Tycowski, K. T., Shu, M. D., and Steitz, J. A. (1996a). A mammalian gene with introns instead of exons generating stable RNA products. *Nature* *379*, 464-466.

Tycowski, K. T., Smith, C. M., Shu, M. D., and Steitz, J. A. (1996b). A small nucleolar RNA requirement for site-specific ribose methylation of rRNA in *Xenopus*. *Proc Natl Acad Sci U S A* *93*, 14480-14485.

Tycowski, K. T., You, Z. H., Graham, P. J., and Steitz, J. A. (1998). Modification of U6 spliceosomal RNA is guided by other small RNAs. *Mol Cell* *2*, 629-638.

Valadkhan, S., and Manley, J. L. (2001). Splicing-related catalysis by protein-free snRNAs. *Nature* *413*, 701-707.

Valadkhan, S., and Manley, J. L. (2003). Characterization of the catalytic activity of U2 and U6 snRNAs. *Rna* *9*, 892-904.

van den Boom, V., Citterio, E., Hoogstraten, D., Zotter, A., Egly, J. M., van Cappellen, W. A., Hoeijmakers, J. H., Houtsmuller, A. B., and Vermeulen, W. (2004). DNA damage stabilizes interaction of CSB with the transcription elongation machinery. *J Cell Biol* *166*, 27-36.

Venema, J., and Tollervey, D. (1999). Ribosome synthesis in *Saccharomyces cerevisiae*. *Annu Rev Genet* *33*, 261-311.

Verheggen, C., Lafontaine, D. L., Samarsky, D., Mouaikel, J., Blanchard, J. M., Bordonne, R., and Bertrand, E. (2002). Mammalian and yeast U3 snoRNPs are matured in specific and related nuclear compartments. *Embo J* *21*, 2736-2745.

Verheggen, C., Mouaikel, J., Thiry, M., Blanchard, J. M., Tollervey, D., Bordonne, R., Lafontaine, D. L., and Bertrand, E. (2001). Box C/D small nucleolar RNA trafficking involves small nucleolar RNP proteins, nucleolar factors and a novel nuclear domain. *Embo J* *20*, 5480-5490.

Vidovic, I., Nottrott, S., Hartmuth, K., Luhrmann, R., and Ficner, R. (2000). Crystal structure of the spliceosomal 15.5kD protein bound to a U4 snRNA fragment. *Mol Cell* *6*, 1331-1342.

Villa, T., Ceradini, F., and Bozzoni, I. (2000). Identification of a novel element required for processing of intron-encoded box C/D small nucleolar RNAs in *Saccharomyces cerevisiae*. *Mol Cell Biol* *20*, 1311-1320.

Villa, T., Ceradini, F., Presutti, C., and Bozzoni, I. (1998). Processing of the intron-encoded U18 small nucleolar RNA in the yeast *Saccharomyces cerevisiae* relies on both exo- and endonucleolytic activities. *Mol Cell Biol* *18*, 3376-3383.

Vitali, P., Royo, H., Seitz, H., Bachellerie, J. P., Huttenhofer, A., and Cavaille, J. (2003). Identification of 13 novel human modification guide RNAs. *Nucleic Acids Res* *31*, 6543-6551.

Vulliamy, T., Marrone, A., Goldman, F., Dearlove, A., Bessler, M., Mason, P. J., and Dokal, I. (2001). The RNA component of telomerase is mutated in autosomal dominant dyskeratosis congenita. *Nature* *413*, 432-435.

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Wan, L., Battle, D. J., Yong, J., Gubitz, A. K., Kolb, S. J., Wang, J., and Dreyfuss, G. (2005). The survival of motor neurons protein determines the capacity for snRNP assembly: biochemical deficiency in spinal muscular atrophy. *Mol Cell Biol* *25*, 5543-5551.

- Wang, C., and Meier, U. T. (2004). Architecture and assembly of mammalian H/ACA small nucleolar and telomerase ribonucleoproteins. *Embo J* 23, 1857-1867.
- Wang, C., Query, C. C., and Meier, U. T. (2002). Immunopurified small nucleolar ribonucleoprotein particles pseudouridylate rRNA independently of their association with phosphorylated Nopp140. *Mol Cell Biol* 22, 8457-8466.
- Wang, H., Boisvert, D., Kim, K. K., Kim, R., and Kim, S. H. (2000). Crystal structure of a fibrillar homologue from *Methanococcus jannaschii*, a hyperthermophile, at 1.6 Å resolution. *Embo J* 19, 317-323.
- Wang, L., Haeusler, R. A., Good, P. D., Thompson, M., Nagar, S., and Engelke, D. R. (2005). Silencing near tRNA genes requires nucleolar localization. *J Biol Chem* 280, 8637-8639.
- Wansink, D. G., Schul, W., van der Kraan, I., van Steensel, B., van Driel, R., and de Jong, L. (1993). Fluorescent labeling of nascent RNA reveals transcription by RNA polymerase II in domains scattered throughout the nucleus. *J Cell Biol* 122, 283-293.
- Watanabe, Y., and Gray, M. W. (2000). Evolutionary appearance of genes encoding proteins associated with box H/ACA snoRNAs: cbf5p in *Euglena gracilis*, an early diverging eukaryote, and candidate Gar1p and Nop10p homologs in archaeobacteria. *Nucleic Acids Res* 28, 2342-2352.
- Watkins, N. J., Dickmanns, A., and Luhrmann, R. (2002). Conserved stem II of the box C/D motif is essential for nucleolar localization and is required, along with the 15.5K protein, for the hierarchical assembly of the box C/D snoRNP. *Mol Cell Biol* 22, 8342-8352.
- Watkins, N. J., Gottschalk, A., Neubauer, G., Kastner, B., Fabrizio, P., Mann, M., and Luhrmann, R. (1998). Cbf5p, a potential pseudouridine synthase, and Nhp2p, a putative RNA-binding protein, are present together with Gar1p in all H BOX/ACA-motif snoRNPs and constitute a common bipartite structure. *Rna* 4, 1549-1568.
- Watkins, N. J., Lemm, I., Ingelfinger, D., Schneider, C., Hossbach, M., Urlaub, H., and Luhrmann, R. (2004). Assembly and maturation of the U3 snoRNP in the nucleoplasm in a large dynamic multiprotein complex. *Mol Cell* 16, 789-798.
- Watkins, N. J., Leverette, R. D., Xia, L., Andrews, M. T., and Maxwell, E. S. (1996). Elements essential for processing intronic U14 snoRNA are located at the termini of the mature snoRNA sequence and include conserved nucleotide boxes C and D. *Rna* 2, 118-133.
- Watkins, N. J., Segault, V., Charpentier, B., Nottrott, S., Fabrizio, P., Bachi, A., Wilm, M., Rosbash, M., Branlant, C., and Luhrmann, R. (2000). A common core RNP structure shared between the small nucleolar box C/D RNPs and the spliceosomal U4 snRNP. *Cell* 103, 457-466.
- Weinstein, L. B., and Steitz, J. A. (1999). Guided tours: from precursor snoRNA to functional snoRNP. *Curr Opin Cell Biol* 11, 378-384.
- 153
- Wenz, C., Enenkel, B., Amacker, M., Kelleher, C., Damm, K., and Lingner, J. (2001). Human telomerase contains two cooperating telomerase RNA molecules. *Embo J* 20, 3526-3534.
- Whitehead, S. E., Jones, K. W., Zhang, X., Cheng, X., Terns, R. M., and Terns, M. P. (2002). Determinants of the interaction of the spinal muscular atrophy disease protein SMN with the dimethylarginine-modified box H/ACA small nucleolar ribonucleoprotein GAR1. *J Biol Chem* 277, 48087-48093.
- Wiesmeijer, K., Molenaar, C., Bekeker, I. M., Tanke, H. J., and Dirks, R. W. (2002). Mobile foci of Sp100 do not contain PML: PML bodies are immobile but PML and Sp100 proteins are not. *J Struct Biol* 140, 180-188.
- Will, C. L., and Luhrmann, R. (2001). Spliceosomal UsnRNP biogenesis, structure and

function. *Curr Opin Cell Biol* 13, 290-301.

Will, C. L., Urlaub, H., Achsel, T., Gentzel, M., Wilm, M., and Luhrmann, R. (2002). Characterization of novel SF3b and 17S U2 snRNP proteins, including a human Prp5p homologue and an SF3b DEAD-box protein. *Embo J* 21, 4978-4988.

Wong, J. M., Kusdra, L., and Collins, K. (2002). Subnuclear shuttling of human telomerase induced by transformation and DNA damage. *Nat Cell Biol* 4, 731-736.

Wong, J. M., Kyasa, M. J., Hutchins, L., and Collins, K. (2004). Telomerase RNA deficiency in peripheral blood mononuclear cells in X-linked dyskeratosis congenita. *Hum Genet* 115, 448-455.

Wu, C. H., and Gall, J. G. (1993). U7 small nuclear RNA in C snurposomes of the *Xenopus* germinal vesicle. *Proc Natl Acad Sci U S A* 90, 6257-6259.

Wu, P., Brockenbrough, J. S., Metcalfe, A. C., Chen, S., and Aris, J. P. (1998). Nop5p is a small nucleolar ribonucleoprotein component required for pre-18 S rRNA processing in yeast. *J Biol Chem* 273, 16453-16463.

Xia, J., Peng, Y., Mian, I. S., and Lue, N. F. (2000). Identification of functionally important domains in the N-terminal region of telomerase reverse transcriptase. *Mol Cell Biol* 20, 5196-5207.

Xia, L., Watkins, N. J., and Maxwell, E. S. (1997). Identification of specific nucleotide sequences and structural elements required for intronic U14 snoRNA processing. *Rna* 3, 17-26.

Xie, S. Q., and Pombo, A. (2006). Distribution of different phosphorylated forms of RNA polymerase II in relation to Cajal and PML bodies in human cells: an ultrastructural study. *Histochem Cell Biol* 125, 21-31.

Xing, Y., Johnson, C. V., Dobner, P. R., and Lawrence, J. B. (1993). Higher level organization of individual gene transcription and RNA splicing. *Science* 259, 1326-1330.

Yang, C., McPheeters, D. S., and Yu, Y. T. (2005a). Psi35 in the branch site recognition region of U2 small nuclear RNA is important for pre-mRNA splicing in *Saccharomyces cerevisiae*. *J Biol Chem* 280, 6655-6662.
154

Yang, P. K., Hoareau, C., Froment, C., Monsarrat, B., Henry, Y., and Chanfreau, G. (2005b). Cotranscriptional recruitment of the pseudouridylsynthetase Cbf5p and of the RNA binding protein Naf1p during H/ACA snoRNP assembly. *Mol Cell Biol* 25, 3295-3304.

Yang, P. K., Rotondo, G., Porras, T., Legrain, P., and Chanfreau, G. (2002a). The Shq1p.Naf1p complex is required for box H/ACA small nucleolar ribonucleoprotein particle biogenesis. *J Biol Chem* 277, 45235-45242.

Yang, Y., Chen, Y., Zhang, C., Huang, H., and Weissman, S. M. (2002b). Nucleolar localization of hTERT protein is associated with telomerase function. *Exp Cell Res* 277, 201-209.

Yang, Y., Isaac, C., Wang, C., Dragon, F., Pogacic, V., and Meier, U. T. (2000). Conserved composition of mammalian box H/ACA and box C/D small nucleolar ribonucleoprotein particles and their interaction with the common factor Nopp140. *Mol Biol Cell* 11, 567-577.

Ye, X., Wei, Y., Nalepa, G., and Harper, J. W. (2003). The cyclin E/Cdk2 substrate p220(NPAT) is required for S-phase entry, histone gene expression, and Cajal body maintenance in human somatic cells. *Mol Cell Biol* 23, 8586-8600.

Yeager, T. R., Neumann, A. A., Englezou, A., Huschtscha, L. I., Noble, J. R., and Reddel, R. R. (1999). Telomerase-negative immortalized human cells contain a novel type of promyelocytic leukemia (PML) body. *Cancer Res* 59, 4175-4179.

- Yong, J., Golembe, T. J., Battle, D. J., Pellizzoni, L., and Dreyfuss, G. (2004a). snRNAs contain specific SMN-binding domains that are essential for snRNP assembly. *Mol Cell Biol* *24*, 2747-2756.
- Yong, J., Pellizzoni, L., and Dreyfuss, G. (2002). Sequence-specific interaction of U1 snRNA with the SMN complex. *Embo J* *21*, 1188-1196.
- Yong, J., Wan, L., and Dreyfuss, G. (2004b). Why do cells need an assembly machine for RNA-protein complexes? *Trends Cell Biol* *14*, 226-232.
- Young, P. J., Le, T. T., Duncley, M., Nguyen, T. M., Burghes, A. H., and Morris, G. E. (2001). Nuclear gems and Cajal (coiled) bodies in fetal tissues: nucleolar distribution of the spinal muscular atrophy protein, SMN. *Exp Cell Res* *265*, 252-261.
- Young, P. J., Le, T. T., thi Man, N., Burghes, A. H., and Morris, G. E. (2000). The relationship between SMN, the spinal muscular atrophy protein, and nuclear coiled bodies in differentiated tissues and cultured cells. *Exp Cell Res* *256*, 365-374.
- Yu, Y. T., Shu, M. D., Narayanan, A., Terns, R. M., Terns, M. P., and Steitz, J. A. (2001). Internal modification of U2 small nuclear (sn)RNA occurs in nucleoli of *Xenopus* oocytes. *J Cell Biol* *152*, 1279-1288.
- Yu, Y. T., Shu, M. D., and Steitz, J. A. (1998). Modifications of U2 snRNA are required for snRNP assembly and pre-mRNA splicing. *Embo J* *17*, 5783-5795.
- Zebarjadian, Y., King, T., Fournier, M. J., Clarke, L., and Carbon, J. (1999). Point mutations in yeast CBF5 can abolish in vivo pseudouridylation of rRNA. *Mol Cell Biol* *19*, 7461-7472. 155
- Zhang, S., Hemmerich, P., and Grosse, F. (2004). Nucleolar localization of the human telomeric repeat binding factor 2 (TRF2). *J Cell Sci* *117*, 3935-3945.
- Zhao, X., Li, Z. H., Terns, R. M., Terns, M. P., and Yu, Y. T. (2002). An H/ACA guide RNA directs U2 pseudouridylation at two different sites in the branchpoint recognition region in *Xenopus* oocytes. *Rna* *8*, 1515-1525.
- Zhao, X., and Yu, Y. T. (2004). Pseudouridines in and near the branch site recognition region of U2 snRNA are required for snRNP biogenesis and pre-mRNA splicing in *Xenopus* oocytes. *Rna* *10*, 681-690.
- Zhou, H., Chen, Y. Q., Du, Y. P., and Qu, L. H. (2002). The *Schizosaccharomyces pombe* mgU6-47 gene is required for 2'-O-methylation of U6 snRNA at A41. *Nucleic Acids Res* *30*, 894-902.
- Zhou, X. Z., and Lu, K. P. (2001). The Pin2/TRF1-interacting protein PinX1 is a potent telomerase inhibitor. *Cell* *107*, 347-359.
- Zhu, Y., Tomlinson, R. L., Lukowiak, A. A., Terns, R. M., and Terns, M. P. (2004). Telomerase RNA accumulates in Cajal bodies in human cancer cells. *Mol Biol Cell* *15*, 81-90.
- Zolotukhin, A. S., and Felber, B. K. (1999). Nucleoporins nup98 and nup214 participate in nuclear export of human immunodeficiency virus type 1 Rev. *J Virol* *73*, 120-127.