

8 LITERATURVERZEICHNIS

- Altman, S.: Enzymatische Spaltung der RNA durch RNA (Nobel-Vortrag). *Angew. Chem.* **1990** (102) 735-744.
- Arnold, F. H.: Design by Directed Evolution. *Acc. Chem. Res.* **1998** (31) 125-131.
- Arnold, F. H. & Volkov, A. A.: Directed evolution of biocatalysts. *Curr. Opin. Chem. Biol.* **1999** (3) 54-59.
- Balkenhohl, F., von dem Bussche-Hünnefeld, C., Lansky, A. & Zechel, C.: Kombinatorische Synthese niedermolekularer organischer Verbindungen. *Angew. Chem.* **1996** (108) 2437-2488.
- Bannwarth, W. & Knorr, R.: Formation of Carboxamides with N, N, N', N' -Tetramethyl (Succinimido) Uronium Tetrafluoroborate in Aqueous / Organic Solvent Systems. *Tetrahedron Lett.* **1991** (32) 1157-1160.
- Barrio, J. R., Barrio, M. C., Leonard, N. J., England, T. E. & Uhlenbeck, O. C.: Synthesis of modified nucleoside 3',5'-bisphosphates and their incorporation into oligoribonucleotides with T4 RNA ligase. *Biochemistry* **1978** (17) 2077-2081.
- Bartel, D. P. & Szostak, J. W.: Isolation of new ribozymes from a large pool of random sequences. *Science* **1993** (261) 1411-1418.
- Bartel, D. P. & Unrau, P. J.: Constructing an RNA world. *Trends Biol. Sci.* **1999** (24) M9-M13.
- Batey, R. T., Rambo, R. P. & Doudna, J. A.: Tertiäre Motive bei Struktur und Faltung von RNA. *Angew. Chem.* **1999** (111) 2472-2491.
- Beaucage, S. L. & Iyer, R. P.: Advances in the synthesis of oligonucleotides by the phosphoramidite approach. *Tetrahedron* **1992** (48) 2223-2311.
- Beaucage, S. L. & Iyer, R. P.: The functionalization of oligonucleotides via phosphoramidite derivatives. *Tetrahedron* **1993a** (49) 1925-1963.
- Beaucage, S. L. & Iyer, R. P.: The synthesis of modified oligonucleotides by the phosphoramidite approach and their applications. *Tetrahedron* **1993b** (49) 6123-6194.
- Beaudry, A. A. & Joyce, G. F.: Minimum secondary structure requirements for catalytic activity of a self-splicing group I intron. *Biochemistry* **1990** (29) 6534-6539.
- Benner, S. A.: Catalysis: design versus selection [comment]. *Science* **1993** (261) 1402-1403.
- Benseler, F., Fu, D.-J., Ludwig, J. & McLaughlin, L. W.: Hammerhead-like molecules containing non-nucleoside linkers are active RNA catalysts. *J. Am. Chem. Soc.* **1993** (115) 8483-8484.

- Blackburn, G. M. & Gait, M. J.: *Nucleic Acids in Chemistry and Biology*, **1996** Seiten 309-318 (Oxford, Oxford University Press).
- Bock, L. C., Griffin, L. C., Latham, J. A., Vermaas, E. H. & Toole, J. J.: Selection of single-stranded DNA molecules that bind and inhibit human thrombin. *Nature* **1992** (355) 564-566.
- Breaker, R. R.: DNA Enzymes. *Nat. Biotechnol.* **1997a** (15) 427-431.
- Breaker, R. R.: In vitro selection of catalytic polynucleotides. *Chem. Rev.* **1997b** (97) 371-390.
- Breaker, R. R. & Joyce, G. F.: A DNA enzyme that cleaves RNA. *Chem. Biol.* **1994a** (1) 223-229.
- Breaker, R. R. & Joyce, G. F.: Inventing and improving ribozyme function: rational design versus iterative selection methods. *Trends Biotech. Sci.* **1994b** (12) 268-275.
- Brown, H. C., Heim, P. & Yoon, N. M.: Selective Reductions. XV. Reaction of Diborane in Tetrahydrofuran with Selected Organic Compounds Containing Representative Functional Groups. *J. Am. Chem. Soc.* **1970** (92) 1637-1646.
- Bruick, R. K., Koppitz, M., Joyce, G. F. & Orgel, L. E.: A simple procedure for constructing 5'-amino-terminated oligodeoxynucleotides in aqueous solution. *Nucleic Acids Res.* **1997** (25) 1309-1310.
- Burgstaller, P. & Famulok, M.: Synthetische Ribozyme und das erste Desoxyribozym. *Angew. Chem.* **1995** (107) 1303-1307.
- Carmi, N., Shultz, L. A. & Breaker, R. R.: In vitro selection of selfcleaving DNAs. *Chem. Biol.* **1996** (3) 1039-1046.
- Carola, C. & Eckstein, F.: Nucleic acid enzymes. *Curr. Opin. Chem. Biol.* **1999** (3) 274-283.
- Cavaille, J., Nicoloso, M. & Bachellerie, J.-P.: Targeted ribose methylation of RNA in vivo directed by tailored antisense RNA guides. *Nature* **1996** (383) 732-735.
- Cech, T. R.: Self-splicing of group I introns. *Annu. Rev. Biochem.* **1990** (59) 543-568.
- Cech, T. R.: Leben am Ende der Chromosomen: Telomere und Telomerase. *Angew. Chem.* **2000** (112) 34-44.
- Chapman, K. B. & Szostak, J. W.: Isolation of a ribozyme with 5'-5' ligase activity. *Chem. Biol.* **1995** (2) 325-333.
- Charlton, J., Sennello, J. & Smith, D.: In vivo imaging of inflammation using an aptamer inhibitor of human neutrophil elastase. *Chem. Biol.* **1997** (4) 809-816.
- Chaulk, S. G. & MacMillan, A. M.: Caged RNA: photo-control of a ribozyme reaction. *Nucleic Acids Res.* **1998** (26) 3173-3178.

- Chee, M., Yang, R., Hubbell, E. *et al.*: Accessing Genetic Information with High-Density DNA-Arrays. *Science* **1996** (274) 610-614.
- Chu, B. C. F., Wahl, G. M. & Orgel, L. E.: Derivatization of unprotected polynucleotides. *Nucleic Acids Res.* **1983** (11) 6513-6529.
- Chun, S.-M., Jeong, S., Kim, J.-M., Chong, B.-O., Park, Y.-K., Park, H. & Yu, J.: Cholesterol esterase activity by in vitro selection of RNA against a phosphate transition-state analogue. *J. Am. Chem. Soc.* **1999** (121) 10844-10845.
- Ciesiolka, J., Illangasekare, M., Majerfeld, I., Nickles, T., Welch, M., Yarus, M. & Zinnen, S.: Affinity selection-amplification from randomized ribooligonucleotide pools. *Methods Enzymol.* **1996** (267) 315-335.
- Conn, M. M., Prudent, J. R. & Schultz, P. G.: Porphyrin metalation catalyzed by a small RNA molecule. *J. Am. Chem. Soc.* **1996** (118) 7012-7013.
- Corey, M. J. & Corey, E.: On the failure of de novo-designed peptides as biocatalysts. *Proc. Natl. Acad. Sci. USA* **1996** (93) 11428-11434.
- Correl, J. E. T. & Trentham, D. R.: Caged Nucleotides and Neurotransmitters. *Bioorg. Photochem.* **1993** (1) 243.
- Crick, F. H. C.: The origin of the genetic code. *J. Mol. Biol.* **1968** (38) 367-379.
- Cuenoud, B. & Szostak, J. W.: A DNA metalloenzyme with DNA ligase activity. *Nature* **1995** (375) 611-614.
- Czerny, T.: High primer concentration improves PCR amplification from random pools. *Nucleic Acids Res.* **1996** (24) 985-986.
- Dang, C. & Jayasena, S. D.: Oligonucleotide Inhibitors of Taq DNA Polymerase Facilitate Detection of Low Copy Number Targets by PCR. *J. Mol. Biol.* **1996** (264) 268-278.
- De Mesmaeker, A., Häner, R., Martin, P. & Moser, H. E.: Antisense oligonucleotides. *Acc. Chem. Res.* **1995** (28) 366-374.
- DeRisi, J. L., Iyer, V. R. & Brown, P. O.: Exploring the metabolic and genetic control of gene expression on a genomic scale. *Science* **1997** (278) 680-686.
- Drees, B. L.: Progress and variations in two-hybrid and three-hybrid technologies. *Curr. Opin. Chem. Biol.* **1999** (3) 64-70.
- Eaton, B. E.: The joys of in vitro selection: chemically dressing oligonucleotides to satiate protein targets. *Curr. Opin. Chem. Biol.* **1997** (1) 10-16.
- Egli, M.: Wie in vitro selektierte RNA-Aptamere funktionieren - die räumlichen Strukturen von Substrat-RNA-Aptamer-komplexen. *Angew. Chem.* **1997** (109) 494-497.

- Ellington, A. D. & Szostak, J. W.: In vitro selection of RNA molecules that bind specific ligands. *Nature* **1990** (346) 818-822.
- Ellington, A. D. & Szostak, J. W.: Selection in vitro of single-stranded DNA molecules that fold into specific ligand-binding structures. *Nature* **1992** (355) 850-852.
- England, T. E., Bruce, A. G. & Uhlenbeck, O. C.: Specific labeling of 3' termini of RNA with T4 RNA ligase. *Methods Enzymol.* **1980** (65) 65-74.
- England, T. E. & Uhlenbeck, O. C.: Enzymatic oligoribonucleotide synthesis with T4 RNA ligase. *Biochemistry* **1978** (17) 2069-2076.
- Englisch, U. & Gauss, D. H.: Chemisch modifizierte Oligonucleotide als Sonden und Agentien. *Angew. Chem.* **1991** (103) 629-646.
- Erb, E., Janda, K. D. & Brenner, S.: Recursive deconvolution of combinatorial chemical libraries. *Proc. Nat. Acad. Sci. USA* **1994** (91) 11422-11426.
- Faber, K.: Biotransformations in Organic Chemistry, **1996** (Berlin, Springer Verlag).
- Famulok, M.: Molecular recognition of amino acids by RNA aptamers: An L-citrulline binding RNA motif and its evolution into an L-arginine binder. *J. Am. Chem. Soc.* **1994** (116) 1698-1706.
- Famulok, M. & Jenne, A.: Oligonucleotide libraries - variatio delectat. *Curr. Opin. Chem. Biol.* **1998** (2) 320-327.
- Famulok, M. & Szostak, J. W.: In vitro-Selektion spezifisch ligandenbindender Nucleinsäuren. *Angew. Chem.* **1992** (104) 1001-1011.
- Fodor, S. P., Read, J. L., Pirrung, M. C., Stryer, L., Lu, A. T. & Solas, D.: Light-directed, spatially addressable parallel chemical synthesis. *Science* **1991** (251) 767-773.
- Fodor, S. P. A.: Massively Parallel Genomics. *Science* **1997** (277) 393-395.
- Fraundorf, C. & Jäschke, A.: Katalyse organischer Reaktionen durch Ribonucleinsäuren. *Angew. Chem.* **1998** (110) 1449-1451.
- Fromant, M., Blanquet, S. & Plateau, P.: Direct random mutagenesis of gene-sized DNA fragments using polymerase chain reaction. *Anal. Biochem.* **1995** (224) 347-353.
- Gait, M. J.: Oligonucleotide synthesis, a practical approach, **1984** (Oxford, IRL Press).
- Gilbert, W.: The RNA world. *Nature* **1986** (319) 618.
- Gildea, B. A., Coull, J. M. & Koster, H.: *Tetraheron Lett.* **1990** (31) 7095-7098.
- Gold, L., Polisky, B., Uhlenbeck, O. & Yarus, M.: Diversity of oligonucleotide functions. *Annu. Rev. Biochem.* **1995** (64) 763-797.
- Goodchild, J.: Conjugates of oligonucleotides and modified oligonucleotides: a review of their synthesis and properties. *Bioconjugate Chem.* **1990** (1) 165-187.

- Guerrier-Takada, C., Gardiner, K., Marsh, T., Pace, N. & Altman, S.: The RNA moiety of ribonuclease P is the catalytic subunit of the enzyme. *Cell* **1983** (35) 849-857.
- Haldane, J. B. S.: *Enzymes*, **1930** 182 Seiten (London, Longmans).
- Haseloff, J. & Gerlach, W. L.: Simple RNA enzymes with new and highly specific endoribonuclease activities. *Nature* **1988** (334) 585-591.
- Hausch, F., Frauendorf, C. & Jäschke, A.: Design, Synthesis, Derivatization and Characterization of Multifunctional Oligonucleotide conjugates. *Manuskript in Vorbereitung*.
- Hausch, F. & Jäschke, A.: Multiplex-Analyse von DNA-Gemischen mittels photolytisch ablesbaren DNA-Chips. *Deutsche Patentschrift* **2000a** (angemeldet am 26.3.2000) .
- Hausch, F. & Jäschke, A.: Libraries of multifunctional RNA conjugates for the selection of new RNA catalysts. *Bioconjugate Chem.* **1997** (8) 885-890.
- Hausch, F. & Jäschke, A.: A novel carboxy-functionalized photocleavable dinucleotide analog for the selection of RNA catalysts. *Tetrahedron Lett.* **1998** (39) 6157-6158.
- Hausch, F. & Jäschke, A.: Multifunctional DNA conjugates for the *in vitro* Selection of new Catalysts. *Nucleic Acids Res.* **2000b** (28) in press.
- Hermann, T. & Patel, D. J.: Adaptive Recognition by Nucleic Acid Aptamers. *Science* **2000** (287) 820-825.
- Hermanson, G. T.: *Bioconjugate Techniques*, **1996** Seiten (San Diego, Academic Press).
- Hillenkamp, F. & Karas, M.: Mass spectrometry of peptides and proteins by matrix-assisted ultraviolet laser desorption/ionization. *Methods Enzymol.* **1990** (193) 280-295.
- Holmes, C. P.: *J. Org. Chem.* **1997** (62) 2370-2380.
- Hosomi, A. & Sakurai, H.: Conjugate Addition of Allylsilanes to α,β -Enones. A new Method of Stereoselective Introduction of the angular Allyl Group in Fused α,β -Enones. *J. Am. Chem. Soc.* **1977** (99) 1673-1675.
- Houghten, R. A., Pinilla, C., Blondelle, S. E., Appel, J. R., Dooley, C. T. & Cuervo, J. H.: Generation and use of synthetic peptide combinatorial libraries for basic research and drug discovery. *Nature* **1991** (354) 84-86.
- Hovinen, J., Guyaev, A., Azhayev, A. & Lönnberg, H.: Novel solid supports for the preparation of 3'-derivatized oligonucleotides: introduction of 3'-alkylphosphate tether groups bearing amino, carboxy, carboxyamido, and mercapto functionalities. *Tetrahedron* **1994** (50) 7203-7218.
- Hovinen, J., Guzaev, A., Azhayev, A. & Lönnberg, H.: Synthesis of 3'-functionalized oligonucleotides on a single solid support. *Tetrahedron Lett.* **1993** (34) 8169-8172.

- Huang, Z. & Szostak, J. W.: A simple method for 3'-labeling of RNA. *Nucleic Acids Res.* **1996** (24) 4360-4361.
- Igloi, G.: Nonradioactive Labeling of RNA. *Anal. Biochem.* **1996** (233) 124-129.
- Igloi, G. L. & Kössel, H.: Affinity electrophoresis for monitoring terminal phosphorylation and the presence of queuosine in RNA. Application of polyacrylamide containing covalently bound boronic acid. *Nucleic Acids Res.* **1985** (13) 6881-6898.
- Illangasekare, M., Sanchez, G., Nickles, T. & Yarus, M.: Aminoacyl-RNA synthesis catalyzed by an RNA. *Science* **1995** (267) 643-647.
- Jäschke, A.: Oligonucleotide-polyethylene glycol conjugates - synthesis, properties and applications, in: Harris, J. M. & Zalipsky, S. (Eds.) *Chemistry and Biological Applications of PEG*, **1997** pp. 265-283 (ACS Symp. Ser.).
- Jäschke, A.: Catalysis of organic reactions by RNA - strategies for the selection of catalytic RNAs, in: Eggleston, D. S., Prescott, C. D. & Pearson, N. D. (Eds.) *The many faces of RNA*, **1998** pp. 179-190 (San Diego, Academic Press).
- Jäschke, A., Bald, R., Nordhoff, E., Hillenkamp, F., Cech, D., Erdmann, V. A. & Fürste, J. P.: Synthesis and analytical characterization of RNA-polyethylene glycol conjugates. *Nucleosides Nucleotides* **1996** (15) 1519-1529.
- Jäschke, A., Frauendorf, C. & Hausch, F.: In vitro selected oligonucleotides as tools in organic chemistry. *Synlett* **1999** 825-833.
- Jäschke, A., Fürste, J. P., Cech, D. & Erdmann, V. A.: Automated incorporation of polyethylene glycol into synthetic oligonucleotides. *Tetrahedron Lett.* **1993** (34) 301-304.
- Jäschke, A., Fürste, J. P., Nordhoff, E., Hillenkamp, F., Cech, D. & Erdmann, V. A.: Synthesis and properties of oligodeoxyribonucleotide- polyethylene glycol conjugates. *Nucleic Acids Res.* **1994** (22) 4810-4817.
- Jäschke, A. & Seelig, B.: Evolution of DNA/RNA as catalysts for chemical reactions. *Curr. Opin. Chem. Biol.* **2000** (4) im Druck.
- Jenison, R. D., Gill, S. C., Pardi, A. & Polisky, B.: High-resolution molecular discrimination by RNA. *Science* **1994** (263) 1425-1429.
- Jenne, A. & Famulok, M.: A novel ribozyme with ester transferase activity. *Chem. Biol.* **1998** (5) 23-34.
- Joyce, G. F.: RNA evolution and the origins of life. *Nature* **1989** (338) 217-224.
- Joyce, G. F.: Directed molecular evolution. *Sci. Am.* **1992** (267) 90-97.

- Joyce, G. F.: Nucleic acid enzymes: Playing with a fuller deck. *Proc. Natl. Acad. Sci. USA* **1998** (95) 5845-5847.
- Karas, M. & Hillenkamp, F.: Laser desorption ionization of proteins with molecular masses exceeding 10,000 daltons. *Anal. Chem.* **1988** (60) 2299-2301.
- Kirby, A. J.: Enzyme - Mechanismen, Modellreaktionen und Mimetica. *Angew. Chem.* **1996** (108) 770-790.
- Kirpekar, F., Nordhoff, E., Larsen, L. K., Kristiansen, K., Roepstorff, P. & Hillenkamp, F.: DNA sequence analysis by MALDI mass spectrometry. *Nucleic Acids Res.* **1998** (26) 2554-2559.
- Klußmann, S., Nolte, A., Bald, R., Erdmann, V. A. & Fürste, J. P.: Mirror-image RNA that binds D-adenosine. *Nat. Biotechnol.* **1996** (14) 1112-1115.
- Knapp, G.: Enzymatic approaches to probing of RNA secondary and tertiary structure. *Methods Enzymol.* **1989** (180) 192-212.
- Knorr, R., Trzeciak, A., Bannwarth, W. & Gillessen, D.: New Coupling Reagents in Peptide Chemistry. *Tetrahedron Lett.* **1989** (30) 1927-1930.
- Koster, H., Tang, K., Fu, D.-J. *et al.*: DNA Diagnostics based on Mass Spectroscopy. *WO-Patent 98/20166* **1998** (Sequenom Inc., San Diego, USA) PCT/US97/20444.
- Kruger, K., Grabowski, P. J., Zaug, A. J., Sands, J., Gottschling, D. E. & Cech, T. R.: Self-splicing RNA: autoexcision and autocyclization of the ribosomal RNA intervening sequence of Tetrahymena. *Cell* **1982** (31) 147-157.
- Kuntz, K. W., Snapper, M. L. & Hoveyda, A. H.: Combinatorial catalyst discovery. *Curr. Opin. Chem. Biol.* **1999** (3) 313-319.
- Lam, K. S., Lebl, M. & Krchnak, V.: The "One-Bead-One-Compound" Combinatorial Library Method. *Chem. Rev.* **1997** (97) 411-448.
- Lam, K. S., Salmon, S. E., Hersh, E. M., Hruby, J., Kazmierski, W. M. & Knapp, R. J.: A new type of synthetic peptide library for identifying ligand-binding activity. *Nature* **1991** (354) 82-84.
- Landweber, L. F. & Pokrovskaya, I. D.: Emergence of a dual-catalytic RNA with metal-specific cleavage and ligase activities: the spandrels of RNA evolution. *Proc. Natl. Acad. Sci. USA* **1999** (96) 173-178.
- Lauhon, C. T. & Szostak, J. W.: RNA aptamers that bind flavin and nicotinamide cofactors. *J. Am. Chem. Soc.* **1995** (117) 1246-1257.

- Lee, S.-W. & Sullenger, B. A.: Isolation of a nuclease-resistant decoy RNA that can protect human acetylcholine receptors from myasthenic antibodies. *Nature Biotechnol.* **1997** (15) 41-45.
- Lerner, R. A., Benkovic, S. J. & Schultz, P. G.: At the crossroads of chemistry and immunology: catalytic antibodies. *Science* **1991** (252) 659-667.
- Lewin, R.: RNA catalysis gives fresh perspective on the origin of life. *Science* **1986** (231) 545-546.
- Li, Y. & Breaker, R. R.: Deoxyribozymes: new players in the ancient game of biocatalysis. *Curr. Opin. Struct. Biol.* **1999** (9) 315-323.
- Li, Y. & Breaker, R. R.: Phosphorylating DNA with DNA. *Proc. Natl. Acad. Sci. USA* **1999** (96) 2746-2751.
- Liu, D. R. & Schultz, P. G.: Das Hervorbringen neuer molekularer Funktionen: ein Lehrstück der Natur. *Angew. Chem.* **1999** (111) 36-56.
- Lorsch, J. R., Bartel, D. P. & Szostak, J. W.: Reverse transcriptase reads through a 2'-5'-linkage and a 2'- thiophosphate in a template. *Nucleic Acids Res.* **1995** (23) 2811-2814.
- Lorsch, J. R. & Szostak, J. W.: In vitro evolution of new ribozymes with polynucleotide kinase activity. *Nature* **1994** (371) 31-36.
- Lorsch, J. R. & Szostak, J. W.: Chance and necessity in the selection of nucleic acid catalysts. *Acc. Chem. Res.* **1996** (29) 103-110.
- Martin, A. B. & Schultz, P. G.: Opportunities at the interface of chemistry and biology. *Trends Biol. Sci.* **1999** (9) 0968-0004.
- Milligan, J. F., Groebe, D. R., Witherell, G. W. & Uhlenbeck, O. C.: Oligoribonucleotide synthesis using T7 RNA polymerase and synthetic DNA templates. *Nucleic Acids Res.* **1987** (15) 8783-8798.
- Minshull, J. & Stemmer, W. P. C.: Protein evolution by molecular breeding. *Curr. Opin. Chem. Biol.* **1999** (3) 284-290.
- Monroe, W. T., McQuain, M. M., Chang, M. S., Alexander, J. S. & Haselton, F. R.: Targeting expression with light using caged DNA. *J. Biol. Chem.* **1999** (274) 20895-20900.
- Moore, M. J. & Sharp, P. A.: Evidence for two active sites in the spliceosome provided by stereochemistry of pre-mRNA splicing [see comments]. *Nature* **1993** (365) 364-368.
- Morris, K. N., Tarasow, T. M., Julin, C. M., Simons, S. L., Hilvert, D. & Gold, L.: Enrichment for RNA molecules that bind a Diels-Alder transition state analog. *Proc. Natl. Acad. Sci. USA* **1994** (91) 13028-13032.

- Murray, H. L. & Jarrell, K. A.: Flipping the Switch to an Active Spliceosome. *Cell* **1999** (96) 599-602.
- Needels, M. C., Jones, D. G., Tate, E. H., Heinkel, G. L., Kochersperger, L. M., Dower, W. J., Barrett, R. W. & Gallop, M. A.: Generation and screening of an oligonucleotide-encoded synthetic peptide library. *Proc. Natl. Acad. Sci. USA* **1993** (90) 10700-10704.
- Nefzi, A., Ostresh, J. M. & Houghten, R. A.: The Current Status of Heterocyclic Combinatorial Libraries. *Chem. Rev.* **1997** (97) 449-472.
- Nicolaou, K. C., Xiao, X.-Y., Parandoosh, Z., Senyei, A. & Nova, M. P.: Radiofrequenz-verschlüsselte kombinatorische Chemie. *Angew. Chem.* **1995** (107) 2476-2479.
- Niemeyer, C. M. & Blohm, D.: DNA-Mikroarrays. *Angew. Chem.* **1999** (111) 3039-3043.
- Nieuwlandt, D., Wecker, M. & Gold, L.: In vitro selection of RNA ligands to substance P. *Biochemistry* **1995** (34) 5651-5659.
- Nikawa, J. & Shiba, T.: Reduction of Carboxylic Acids to Alcohols through 1-Succinimidyl Esters with NaBH₄. *Chem. Lett.* **1979** 981-982.
- Noller, H. F.: Ribosomal RNA and Translation. *Annu. Rev. Biochem.* **1991** (60) 191-227.
- Nordhoff, E., Cramer, R., Karas, M., Hillenkamp, F., Kirpekar, F., Kristiansen, K. & Roepstorff, P.: Ion stability of nucleic acids in infrared matrix-assisted laser desorption/ionization mass spectrometry. *Nucleic Acids Res.* **1993** (21) 3347-3357.
- Oh, B.-K. & Pace, N. R.: Interaction of the 3'-end of tRNA with ribonuclease P RNA. *Nucleic Acids Res.* **1994** (22) 4087-4094.
- Olejniak, J., Krzymanska-Olejniak, E. & Rothschild, K. J.: Photocleavable biotin phosphoramidite for 5'-end-labeling, affinity purification and phosphorylation of synthetic oligonucleotides. *Nucleic Acids Res.* **1996** (24) 361-366.
- Olejniak, J., Krzymanska-Olejniak, E. & Rothschild, K. J.: Photocleavable aminotag phosphoramidites for 5'-terminal DNA/RNA labeling. *Nucleic Acids Res.* **1998** (26) 3572-3576.
- Ordoukhanian, P. & Taylor, J. S.: Design and synthesis of a versatile photocleavable DNA building block. Application to phototriggered hybridization. *J. Am. Chem. Soc.* **1995** (117) 9570-9571.
- Orgel, L. E.: Evolution of the genetic apparatus. *J. Mol. Biol.* **1968** (38) 381-393.
- Osborne, S. E. & Ellington, A. D.: Nucleic Acid selection and the challenge of combinatorial chemistry. *Chem. Rev.* **1997** (97) 349-370.
- Pauling, L.: *Chem. Eng. News* **1946** (24) 1375.
- Persidis, A.: Ribozyme Therapeutics. *Nat. Biotechnol.* **1997** (15) 921-922.

- Persidis, A.: Antisense Therapeutics. *Nat. Biotechnol.* **1999** (17) 403-404.
- Pillai, V. N. R.: Photoremovable protecting groups in organic synthesis. *Synthesis* **1980** 1-26.
- Pirrung, M. C.: Spatially Addressable Combinatorial Libraries. *Chem. Rev.* **1997** (97) 473-488.
- Prudent, J. R. & Schultz, P. G.: RNA catalysis and transition state stabilization, in: Eckstein, F. & Lilley, D. M. J. (Eds.) *Catalytic RNA*, **1996** pp. 383-395 (Berlin, Springer).
- Prudent, J. R., Uno, T. & Schultz, P. G.: Expanding the scope of RNA catalysis. *Science* **1994** (264) 1924-1927.
- Rich, A.: DNA comes in many forms. *Gene* **1993** (1353) 99-109.
- Richardson, R. W. & Gumport, R. I.: Biotin and fluorescent labeling of RNA using T4 RNA ligase. *Nucleic Acids Res.* **1983** (11) 6167-6184.
- Roberts, R. W. & Szostak, J. W.: RNA-peptide fusions for the in vitro selection of peptides and proteins. *Proc. Natl. Acad. Sci. USA* **1997** (94) 12297-12302.
- Rogers, J. & Joyce, G. F.: A ribozyme that lacks cytidine. *Nature* **1999** (402) 323-325.
- Romaniuk, P. J. & Uhlenbeck, O. C.: Joining of RNA molecules with RNA ligase. *Methods Enzymol.* **1983** (100) 52-59.
- Rumney, S. & Kool, E. T.: Structural optimization of non-nucleotide loop replacements for duplex and triplex DNA. *J. Am. Chem. Soc.* **1995** (117) 5635-5646.
- Ruppert, T. & Jäschke, A.: Selektion von Ribozymen mit Aminoacyl-Transferase-Aktivität. *Manuskript In Vorbereitung.*
- Sabeti, P. C., Unrau, P. J. & Bartel, D. P.: Accessing rare activities from random RNA sequences: the importance of the length of molecules in the starting pool. *Chem. Biol.* **1997** (4) 767-774.
158. Sakthivel, K. & Barbas III, C. F.: Erweiterung der Bindungs- und Katalyseeigenschaften von DNA: hochfunktionalisierte dUTP-Derivate als Substrate für thermostabile DNA-Polymerasen. *Angew. Chem.* **1998** (110) 2998-3002.
- Santoro, S. W. & Joyce, G. F.: A general purpose RNA-cleaving DNA enzyme. *Proc. Natl. Acad. Sci. USA* **1997** (94) 4262-4266.
- Sassanfar, M. & Szostak, J. W.: An RNA motif that binds ATP. *Nature* **1993** (364) 550-553.
- Schultz, P. G.: Antikörper als Katalysatoren. *Angew. Chem.* **1989** (101) 1336-1348.
- Schultz, P. G. & Lerner, R. A.: Antibody catalysis of difficult chemical transformations. *Acc. Chem. Res.* **1993** (26) 391-395.
- Schultz, P. G. & Lerner, R. A.: From molecular diversity to catalysis: lessons from the immune system. *Science* **1995** (269) 1835-1842.

- Schwienhorst, A.: Molekulare Evolution funktionaler Nucleinsäuren. *Chemie in unserer Zeit* **1999** (33) 110-119.
- Scott, W. G. & Klug, A.: Ribozymes: structure and mechanism in RNA catalysis. *Trends Biol. Sci.* **1996** (21) 220-224.
- Seelig, B.: Katalyse der Diels-Alder Reaktion durch Ribonucleinsäuren: Isolierung und Charakterisierung neuer Ribozyme *Institut für Chemie/Biochemie*, **1999a** 93 dissertation.de (Freie Universität Berlin).
- Seelig, B. & Jäschke, A.: Site-specific modification of enzymatically synthesized RNA: transcription initiation and Diels-Alder reaction. *Tetrahedron Lett.* **1997** (38) 7729-7732.
- Seelig, B. & Jäschke, A.: A small catalytic RNA motif with Diels-Alderase activity. *Chem. Biol.* **1999b** (6) 167-176.
- Seelig, B. & Jäschke, A.: Ternary conjugates of guanosine monophosphate as initiator nucleotides for the enzymatic synthesis of 5'-modified RNAs. *Bioconjugate Chem.* **1999c** (10) 371-378.
- Sen, D. & Geyer, C. R.: DNA enzymes. *Curr. Opin. Chem. Biol.* **1998** (2) 680-687.
- Sengle, G. & Famulok, M.: Selektion von Ribozymen, die eine Michael-Addition beschleunigen. *Persönliche Mitteilung* (Kloster Banz, 14.11.-18.11.1999) DFG Schwerpunkt: RNA Biochemie.
- Sengle, G., Jenne, A., Arora, P. S., Seelig, B., Nowick, J. S., Jäschke, A. & Famulok, M.: Synthesis, Incorporation Efficiency, and Stability of Disulfide Bridged Functional Groups at RNA 5'-Ends. *Bioorg. Med. Chem.* **2000** (im Druck) .
- Silveira, M. H. & Orgel, L. E.: PCR with detachable primers. *Nucleic Acids Res* **1995** (23) 1083-1084.
- Sinha, S. C., Barbas III, C. F. & Lerner, R. A.: The antibody catalysis route to the total synthesis of epothilones. *Proc. Natl. Acad. Sci. USA* **1998** (95) 14603-14608.
- Smith, D., Kirschenheuter, G. P., Charlton, J., Guidot, D. M. & Repine, J. E.: In vitro selection of RNA-based irreversible inhibitors of human neutrophil elastase. *Chem. Biol.* **1995** (2) 741-750.
- Smith, G. P. & Petrenko, V. A.: Phage Display. *Chem. Rev.* **1997** (97) 391-410.
- Soukup, G. A., Cerny, R. L. & Maher III, L. J.: Preparation of Oligonucleotide-Biotin Conjugates with Cleavable Linkers. *Bioconjugate Chem.* **1995** (6) 135-138.
- Szostak, J. W.: Ribozymes. Evolution ex vivo [news; comment]. *Nature* **1993** (361) 119-120.

- Tanmaya, P. & Waldmann, H.: Enzymes and protecting group chemistry. *Curr. Opin. Chem. Biol.* **1998** (2) 112-120.
- Tarasow, T. M., Tarasow, S. L. & Eaton, B. E.: RNA-catalysed carbon-carbon bond formation. *Nature* **1997** (389) 54-57.
- Tarasow, T. M., Tarasow, S. L., Tu, C., Kellogg, E. & Eaton, B. E.: Characteristics of an RNA Diels-Alderase active site. *J. Am. Chem. Soc.* **1999** (121) 3614-3617.
- Tawfik, D. S. & Griffiths, A. D.: Man-made cell-like compartments for molecular evolution. *Nat. Biotechnol.* **1998** (16) 652-656.
- Terrett, N. K., Gardner, M., Gordon, D. W., Kobylecki, R. J. & Steele, J.: Combinatorial Synthesis - The Design of Compound Libraries and their Application to Drug Discovery. *Tetrahedron* **1995** (51) 8135-8173.
- Thomas, J. M.: Wendepunkte der Katalyse. *Angew. Chem.* **1994** (106) 963-989.
- Thomson, J. B., Tuschl, T. & Eckstein, F.: Activity of hammerhead ribozymes containing non-nucleotidic linkers. *Nucleic Acids Res.* **1993** (21) 5600-5603.
- Thuong, N. T. & Helene, C.: Sequenzspezifische Erkennung und Modifikation von Doppelhelix-DNA durch Oligonucleotide. *Angew. Chem.* **1993** (105) 697-723.
- Trawick, B. N., Daniher, A. T. & Bashkin, J. K.: Inorganic Mimics of Ribonucleases and Ribozymes: From Random Cleavage to Sequence-Specific Chemistry to Catalytical Antisense Drugs. *Chem. Rev.* **1998** (98) 939-960.
- Tsang, J. & Joyce, G. F.: In vitro evolution of randomized ribozymes. *Methods Enzymol.* **1996** (267) 410-426.
- Tuerk, C. & Gold, L.: Systematic evolution of ligands by exponential enrichment: RNA ligands to bacteriophage T4 DNA polymerase. *Science* **1990** (249) 505-510.
- Tyagi, S. & Kramer, F. K.: Molecular Beacons: Probes that Fluoresce upon Hybridization. *Nat. Biotechnol.* **1996** (14) 303-308.
- Uhlenbeck, O. C.: A small catalytic oligoribonucleotide. *Nature* **1987** (328) 596-600.
- Unrau, P. J. & Bartel, D. P.: RNA-catalyzed nucleotide synthesis. *Nature* **1998** (395) 260-263.
- Vaish, N. K., Heaton, P. A. & Eckstein, F.: Isolation of hammerhead ribozymes with altered core sequences by in vitro selection. *Biochemistry* **1997** (36) 6495-6501.
- Wecker, M., Smith, D. & Gold, L.: In vitro selection of a novel catalytic RNA: characterization of a sulfur alkylation reaction and interaction with a small peptide. *RNA* **1996** (2) 982-994.

- Wedel, A. B.: Fishing the best pool for novel ribozymes. *Trends Biotechnol.* **1996** (14) 459-465.
- Weilbaecher, R. G. & Lundblad, V.: Assembly and regulation of telomerase. *Curr. Opin. Chem. Biol.* **1999** (3) 573-577.
- Wells, W. A.: A beginning, of sorts, for antisense Isis Pharmaceuticals, Inc. *Chem. Biol.* **1999** (6) R49-R50.
- Westman, E. & Strömberg, R.: Removal of t-butyldimethylsilyl protection in RNA synthesis. Triethylamine trihydrofluoride (TEA, 3HF) is a more reliable alternative to tetrabutylammonium fluoride (TBAF). *Nucleic Acids Res.* **1994** (22) 2430-2431.
- Williams, K. P. & Bartel, D. P.: In vitro selection of catalytic RNA, in: Eckstein, F. & Lilley, D. M. J. (Eds.) *Catalytic RNA*, **1996** pp. 367-381 (Berlin, Springer).
- Wilson, C. & Szostak, J. W.: In vitro evolution of a self-alkylating ribozyme. *Nature* **1995** (374) 777-782.
- Wong, J. C., Kuhl, T. C., Israelachvili, J. N., Mullah, N. & Zalipsky, S.: Direct measurement of a tethered ligand-receptor interaction potential. *Science* **1997** (275) 820-822.
- Yarus, M.: Boundaries for an RNA world. *Curr. Opin. Chem. Biol.* **1999** (3) 260-267.
- Ylera-Dahmen, F.: Selektion hochaffiner RNA-Moleküle gegen das Alzheimer β -Amyloid *Institut für Biochemie*, **1998** Dissertation (Freie Universität Berlin).
- Yoo, D. J. & Greenberg, M. M.: Synthesis of Oligonucleotides Containing 3'-Alkyl Carboxylic Acids Using Universal, Photolabile Solid Phase Synthesis Supports. *J. Org. Chem.* **1995** (60) 3358-3364.
- Zhang, B. & Cech, T. R.: Peptide bond formation by in vitro selected ribozymes. *Nature* **1997** (390) 96-100.