

Curriculum Vitae

Shu-ou Shan, Ph.D.

Division of Chemistry and Chemical Engineering
California Institute of Technology, MC 147-75
Pasadena, CA 91125
Phone: 626-395-3879
e-mail: sshan@caltech.edu

Education:

1991-1994	University of Maryland	B.S. in Chemistry and Biochemistry
1994-2000	Stanford University	Ph.D. in Biochemistry

Positions and experience:

1991-1994	Undergraduate research with Dr. R. N. Armstrong, University of Maryland; Substrate specificity in Glutathione-S-Transferase.
1994-2000	Doctoral research with Dr. Daniel Herschlag, Stanford University; (1) Energetics of hydrogen bonds in model systems and implications for enzymatic catalysis; (2) The role of metal ions in catalysis of RNA enzymes.
2000-2005	Post-doctoral research with Dr. Peter Walter, U.C. San Francisco Mechanism of Signal Recognition Particle-dependent protein transport
2005-2011	Assistant Professor, California Institute of Technology
2011 - current	Professor, California Institute of Technology
2015 - 2025	Executive officer, BMB program at CalTech
2019 - 2029	Altair Professor of Chemistry, California Institute of Technology

Honors/Services

1992	CRC Freshman Chemistry Achievement Award
1998-1999	Lieberman Fellowship for Graduate Research
1999	Charles Yanofsky Graduate Research Award
2000-2003	Cancer Research Fund Fellowship, Damon Runyon-Walter Winchell Foundation
2000	Jane Coffin Childs Memorial Fund Fellowship (declined)
2003-2008	Career Award in Biomedical Sciences, Burroughs Wellcome Fund
2005-2008	Camille and Henry Dreyfus New Faculty Award
2007-2010	Beckman Young Investigator Award, Arnold and Mable Beckman Foundation
2007-2012	David and Lucille Packard Fellowship for science and engineering
2008	Woman in Cell Biology Junior Award, American Society of Cell Biology
2009	Camille and Henry Dreyfus Teacher-Scholar award
2011	Irving Sigal Young Investigator Award, the Protein Society
2011-current	Board of Reviewing editors, Molecular Biology of the Cell
2012	Nobel Laureate Signature Award for Graduate Education, American Chemical Society

2013	Young Investigator Award, American Society of Biochemistry and Molecular Biology
2013-current	Editorial Advisory board, Biochemistry
2013-2015	Associate Editor, Journal of Biological Chemistry
2014	Vice chair, Gordon conference on Protein Transport across Cell Membranes.
2014	Co-chair, Protein Synthesis thematic series, ASBMB meeting.
2016	Chair, Gordon conference on Protein Transport across Cell Membranes.
2016-2022	Member, MBPP study section, NIGMS
2019-current	Editorial board, Journal of Cell Biology
2021	NSF review panel, MCB-MB
2023	DoE Bio review panel: Self-Assembly & Self-Repair
2024	National Academy of Science (NAS) Award in Molecular Biology
2025	Editorial board, Annual Review of Biochemistry
2025	Member, National Academy of Science

Publications (*denotes the corresponding author)

<https://www.ncbi.nlm.nih.gov/myncbi/shu-ou.shan.1/bibliography/public/>

115. Santos, J.[‡], Günnigmann, M.[‡], Gora, R.J.[‡], Iljina, M., Predin, M., Kotan, I.E., De, P., Choudhary, D., Jang, J., Tippmann, F., Ban, N.*, Tans, S.*, Shan, S.O.*, Kramer, G.*, Bukau, B.* (2025) *Molecular Cell*, in revision. “NAC promotes co-translational protein folding at the ribosomal tunnel exit”.

[‡]Equal contributions.

114. Maldosevic, E., Gora, R.J., Lin, L.L., Li, Z.J., Zhou, L.E., Wu, S.A., Peskova, Y., Qi, L., Shu-ou Shan, S.O.*, Jomaa, A.* (2025) *Nature Communications*, in revision. “A molecular switch in NAC regulates mitochondrial protein sorting on ribosomes”.

113. Yudin, D., Mateusz Jaskolowski, M., Fan, Z., Burg, N., Chandrasekar, S., Lentzsch, A.M., Scaiola, A., Bothe, A., Deuerling, E., Gamerding, M.*, Shan, S.O.*, Ban, N.* (2025) *Science Advances*, in press. “Mechanism of co-translational modification of histones H2A and H4 by MetAP1 and NatD”.

112. Lentzsch, A.M., Fan, Z., Irshad, I.U., O’Brien, E.P., Sharma, A.K., Green, R., Shan, S.O.* (2025) *Molecular Cell*, in press. “HYPK promotes N-terminal acetylation through rapid ribosome exchange of NatA”.

111. Qian, R.[‡], Gora, R.J.[‡], Chandrasekar, S., Shan, S.O.* (2025) *J. Mol. Biol.*:169482. doi: 10.1016/j.jmb.2025.169482. “Temporal regulation of signal recognition particle during translation”.

[‡]Equal contributions.

110. Patel, R., Makwana, R., Marchi, E., Fan, Z., Falsey, E., Beatriz, M., Giampietro, P., Wentzensen, I. M., Hsieh, T. C., Shan, S. O., Lyon, G. J.* (2025) *Clinical Genetics*, doi: 10.1111/cge.70039. “HYPK-related Neurodevelopmental Syndrome: Case Report of Intellectual Disability, Developmental Delay, and Dysmorphic Features”.

109. Zhu, Z., Mallik, S., Stevens, T.A., Levy, E.D., Shan, S.O.* (2025) *Cell* 188(20):5605-5617.e14. doi: 10.1016/j.cell.2025.07.021. “Principles of cotranslational mitochondrial protein import revealed by selective ribosome profiling”.

108. Gamerdinger, M.^{‡*}, Blanca Echeverria, B.[‡], Lentzsch, A.M., Burg, N., Fan, Z., Jaskolowski, M., Scaiola, A., Piening, S., Shan, S.O.* (2025) *Molecular Cell*, 85(14):2749-2758.e8. doi: 10.1016/j.molcel.2025.06.015. “Mechanism of cotranslational protein N-myristoylation in human cells”.

[‡]Equal contributions.

107. Siegel, A.R., Kroon, G., Wright, P., Shan, S.O.* (2025) *Science Advances* 11(24):eadu5791. doi: 10.1126/sciadv.adu5791. “Switchable client specificity in a dual functional chaperone coordinates light harvesting complex biogenesis”.

106. Lentzsch, A., Lee, J.H., Shan, S.O.* (2025) *J. Mol. Biol.*, Doi: 10.1016/j.jmb.2025.169056. “Mechanistic insights into protein biogenesis and maturation on the ribosome”.

105. Lentzsch, A.M., Yudin, D., Gamerdinger, M., Chandrasekar, S., Rabl, L., Scaiola, A., Deuerling, E., Ban, N.*, Shan, S.O.* (2024) *Nature* 633(8030):718-724. doi: 10.1038/s41586-024-07846-7. “NAC guides a ribosomal multienzyme complex for nascent protein processing”.

104. Cho, H., Liu, Y., Chung, S.Y., Chandrasekar, S., Weiss, S., Shan, S.O.* (2024) *Nature Communications* 15(1):134, doi: 10.1038/s41467-023-44260-5. “Dynamic stability of Sgt2 enables selective and privileged client handover in a chaperone triad”.

103. Siegel, A.[‡], Singh, J.[‡], Qin, P.Z.*, and Shan, S.O.* (2023) *Biophysics of Molecular Chaperones: Function, Mechanisms, and Client Protein Interactions*. S. Hiller, M. Liu, L. He ed., Royal Society of Chemistry, Chapter 10. doi: 10.1039/9781839165986 “EPR studies of chaperone interactions and dynamics”.

[‡] equal contribution.

102. Gupta, A., Lu, C., Wang, F., Chou, T.F., Shan, S.O.* (2023) *Protein Science* 32(8): e4728. Doi: 10.1002/pro.4728. “An ankyrin repeat chaperone targets toxic oligomers during amyloidogenesis”.

101. Gupta, A.[‡], Lentzsch, A.M.[‡], Siegel, A.[‡], Yu, Z., Chio, U.S., Cheng, Y., Shan, S.O.* (2023) *Science Advances* 9(19): eadf5336. Doi: 10.1126/sciadv.adf5336. “Dodecamer assembly of a metazoan AAA⁺ chaperone couples substrate extraction to refolding”.

[‡] equal contribution.

100. Shan, S.O.* (2023) *Int. J. Mol. Sci.*, 24, 1170. doi: 10.3390/ijms24021170. “Role of Hsp70 in Post-translational Protein Targeting: Tail-anchored Membrane Proteins and Beyond”.

99. Yang CI, Zhu Z, Jones JJ, Lomenick B, Chou TF, Shan SO*. (2022) *iScience* 25(8):104756. doi: 10.1016/j.isci.2022.104756. “System-wide analyses reveal essential roles of N-terminal protein modification in bacterial membrane integrity”.

98. Zhu, Z., Wang, S., and Shan, S.O.* (2022) *Nature Communications* 13(1):3393. doi: 10.1038/s41467-022-31061-5. “Ribosome profiling reveals multiple roles of SecA in cotranslational protein export”.

97. Yang, C.-I., Kim, J.W., Shan, S.O.* (2022) *J. Mol Biol.* 434: 167535. Doi: 10.1016/j.jmb.2022.167535. “Ribosome-nascent chain interaction regulates N-terminal protein modification”.

96. Jomaa, A.[‡], Gamerdinger, M.[‡], Hsieh, H.H.[‡], Wallisch, A., Chandrasekaran, V., Ulusoy, Z., Scaiola, A., Hegde, R.S., Shan, S.O.*, Ban, N.*, Deuerling, E.* (2022) *Science* 375: 839-844. DOI:

10.1126/science.abl6459. “Mechanism of signal sequence handover from NAC to SRP on ribosomes during ER-protein targeting”.

‡ equal contribution.

95. Hsieh, H.H., and Shan, S.O.* (2022) *Int. J. Mol. Sci.*, 23, 281. Doi: [10.3390/ijms23010281](https://doi.org/10.3390/ijms23010281). “Fidelity of Cotranslational Protein Targeting to the Endoplasmic Reticulum”.

94. Chio, U.‡, Liu, Y.‡, Chung, S.Y., Woo Jun Shim, W.J., Chandrasekar, S., Weiss, S., and Shan, S.*, (2021) *J. Cell Biol.* 220, e202103079. Doi: 10.1083/jcb.202103079. “Subunit cooperation in the Get1/2 receptor promotes tail-anchored membrane protein insertion”.

‡ equal contribution.

93. Ji, S.‡, Siegel, S. ‡, Shan, S., Grimm, B.*, and Wang, P.* (2021) *Nature Plants* 7, 1420-32. DOI: 10.1038/s41477-021-00994-y. “Chloroplast SRP43 autonomously protects chlorophyll biosynthesis proteins against heat shock”.

‡ equal contribution.

92. Jomaa, A., Eitzinger, S., Zhu, Z., Chandrasekar, S., Kobayashi, K., Shan, S.*, Ban, N.* (2021) *Cell Reports*, 36: 109350. Doi: 10.1016/j.celrep.2021.109350. “Molecular mechanism of cargo recognition and handover by the mammalian signal recognition particle”.

91. Lee, J., Jomaa, A., Chung, S.Y., HwangFu Y.H., Qian, R., Xuemeng Sun, X., Hsieh, H., Chandrasekar, S., Bi, X., Mattei, S., Boehringer, D., Weiss, S., Ban, N.*, Shan, S.O.* (2021) *Science Advances* 7(21):eabg0942. doi: 10.1126/sciadv.abg0942. “Receptor compaction and GTPase rearrangement drive SRP-mediated cotranslational protein translocation into the ER”.

90. Cho, H., Shim, W.J., Liu, Y., and Shan, S.O.* (2021) *J. Biol. Chem.* 296: 100546. Doi: 10.1016/j.jbc.2021.100546. “J-domain proteins promote client relay from Hsp70 during tail-anchored membrane protein targeting”.

Editor's Picks.

89. Siegel, A. ‡, McAvoy, C.Z. ‡, Lam, V.Q., Liang, F.C., Kroon, G., Miaou, E., Griffin, P.R., Wright, P.E., Shan, S.O.* (2020) *J. Mol. Biol.*, 432, 100768. Doi: 10.1016/j.jmb.2020.11.007. “A disorder-to-order transition activates an ATP-Independent Membrane Protein Chaperone”.

‡equal contribution.

88. Hsieh, H.H., Lee, J.H., Chandrasekar, S., and Shan, S.O.* (2020) *Nature Communications*, 11, 5840. DOI: 10.1038/s41467-020-19548-5. “A ribosome-associated chaperone enables substrate triage in a cotranslational protein targeting complex”.

87. Yang, C.-I., Hsieh, H.-H., Shan, S.O.* (2019) *Proc. Natl. Acad. Sci. U. S. A.*, 116:23050-23060. doi: 10.1073/pnas.1912264116. “Timing and Specificity of Nascent Protein Modification in Bacteria”.

86. Shan, S.O.* (2019) *J. Biol. Chem.* doi: 10.1074/jbc.REV119.006197. “Guiding Tail-anchored Membrane Proteins to the ER in a Chaperone Cascade”

85. Chio, U.S.; Chung, S.Y.; Weiss, S.; Shan, S.O. (2019) *Cell Reports* 26, 37-44.e7. doi: 10.1016/j.celrep.2018.12.035. “A chaperone lid ensures efficient and privileged client transfer during tail-anchored protein targeting”.

84. Wang, S., Jomaa, A., Jaskowski, M., Yang, Chien-I, Y., Ban, N., and Shan, S.O.* (2019) *Nature Struct. Mol. Biol.* 26:919-929. doi:10.1038/s41594-019-0297-8. "Molecular mechanism of cotranslational membrane protein recognition and targeting by SecA".
83. Hwang Fu, Y.H., Chandrasekar, S., Lee, J.H., and Shan, S.O.* (2019) *J. Cell Biol.*, 218:3307-3319. doi: 10.1083/jcb.201901001. "A Molecular Recognition Feature mediates ribosome-induced SRP-receptor assembly in protein targeting".
82. Cho, H., Chio, U.S., and Shan, S.O.* (2018) *Curr. Protoc. Cell Biol.*, 81: e63. DOI: [10.1002/cpcb.63](https://doi.org/10.1002/cpcb.63). "In vitro assays for targeting and insertion of tail-anchored proteins into the ER membrane".
81. Cho, H. and Shan, S.O.* (2018) *EMBO J.*, 37: e99264. "Substrate relay in an Hsp70-cochaperone cascade safeguards tail-anchored membrane protein targeting".
80. Lee, J., Chandrasekar, S., Chung, S.Y., HwangFu, Y.H., Liu, D., Weiss, S., Shan, S.O.* (2018) *Proc. Natl. Acad. Sci. U. S. A.* 115: E5487-5496. "Sequential activation of human signal recognition particle by the ribosome and signal sequence drives efficient protein targeting".
79. McAvoy, C., Siegel, A., Piszkiwicz, S., Miaou, E., Yu, M., Nguyen, T., Moradian, A., Sweredoski, M.J., Hess, S., Shan, S.O.* (2018) *J. Biol. Chem.* 293: 8861-8873. DOI: 10.1074/jbc.RA118.002215. "Two distinct sites of client protein interaction with the chaperone cpSRP43".
78. Kobayashi, K., Jomaa, A., Lee, J.H., Chandrasekar, S., Boehringer, D., Shan, S.O.*, Ban, N.* (2018) *Science*, 360: 323-327. DOI: 10.1126/science.aar7924. "Structure of a prehandover mammalian ribosomal SRP•SRP receptor targeting complex".
77. Wang, P., Liang, F.C., Wittemann, D., Siegel, A., Shan, S.O.*, Grimm, B.* (2018) *Proc. Natl. Acad. Sci. U. S. A.*, 115: E3588-3596. "Chloroplast SRP43 acts as a chaperone for glutamyl-tRNA reductase, the rate-limiting enzyme in tetrapyrrole biosynthesis".
76. Chio, U., Chung, S.Y., Weiss, S., Shan, S.O.* (2017) *Proc. Natl. Acad. Sci. U. S. A.*, 114: E8585-8594. Doi: 10.1073/pnas.1708731114. "A protean clamp guides membrane targeting of tail-anchored proteins".
75. Wang, S., Yang, C.I., Shan, S.O.* (2017) *J. Cell Biol.* 216: 3639-3653. Doi: 10.1083/jcb.201704036. "SecA mediates co-translational targeting and translocation of an inner membrane protein".
74. Chio, U., Cho, H., Shan, S.O.* (2017) *Annu. Rev. Cell Dev. Biology* 33: 417-438. Doi: 10.1146/annurev-cellbio-100616-060839. "Mechanisms of tail-anchored membrane protein targeting and insertion".
73. HwangFu, Y., Huang, W.Y.C., Shen, K., Groves, J.T., Miller, T., Shan, S.O.* (2017) *elife* 6: e25885. "Two step membrane binding by the bacterial SRP receptor enables efficient and accurate co-translational protein targeting".
72. Jomaa, A., HwangFu, Y., Boehringer, D., Leibundgut, M., Shan, S.O., Ban, N.* (2017) *Nature Commun.* 8: 15470. Doi: 10.1038/ncomms15470. "Structure of the quaternary complex between SRP, SR, and translocon bound to the translating ribosome". PMID: 28524878.

71. Chandrasekar, S., Sweredoski, M.J., Sohn, C.H., Hess, S., Shan, S.O.* (2017) *J. Biol. Chem.* 292: 386-396. Doi: 10.1074/jbc.M116.752931. "Co-evolution of two GTPases enables efficient protein targeting in an RNA-less chloroplast Signal Recognition Particle pathway." PMID: 27895118
70. Chandrasekar, S., Shan, S.O.* (2017) *J. Biol. Chem.* 292: 397-406. Doi: 10.1074/jbc.M116.752956. "Anionic phospholipids and the Albino3 translocase activate SRP-receptor interaction during LHCP targeting." PMID: 27895124
69. Rao, M., Okreglak, V., Chio, U.S., Cho, H., Walter, P., Shan, S.O.* (2016) *eLife* 5: e21301. Doi: 10.7554/eLife.21301. "Multiple selection filters ensure accurate tail-anchored membrane protein targeting." PMID: 27925580
68. Shan, S.O.* (2016) *Trends Biochem. Sci.* 41: 1050-1060. Doi: 10.1016/j.tibs.2016.08.012. "ATPase and GTPase Tangos drive intracellular protein transport". PMID: 27658684
67. Liu, W., Zhou, M., Li, Z., Li, H., Polaczek, P., Dai, H., Wu, Q., Liu, C., Karanja, K.K., Popuri, V., Shan, S.O., Schlacher, K., Zheng, L., Campbell, J.L., Shen, B.* (2016) *EBioMedicine* 6:73-86. "A Selective Small Molecule DNA2 Inhibitor for Sensitization of Human Cancer Cells to Chemotherapy".
66. Liang, F.-C., Kroon, G., McAvoy, C., Chi, C., Wright, P.*, and Shan, S.O.* (2016) *Proc. Natl. Acad. Sci. U. S. A.* 113: E1615-24. Doi: 10.1073/pnas.1524777113. "Conformational dynamics of a membrane protein chaperone enables spatially-regulated substrate capture and release".
65. Chen, Y., Shen, K., Shan, S.O.*, and Kou, S.C.* (2016) *Journal of the American Statistical Association* 111:515, 951-966. DOI:10.1080/01621459.2016.1140050. "Analyzing single-molecule protein transportation experiments via hierarchical hidden Markov Models".
64. Gristick, H.B., Rome, M.E., Chartron, J., Rao, M., Hess, S., Shan, S.O.* and Clemons, W.M.Jr.* (2015) *J. Biol. Chem.* 290: 30006-30017. doi:10.1074/jbc.M115.677328. "Mechanism of assembly of a substrate-transfer complex during tail-anchored protein targeting".
63. Ariosa, A.R., Lee, J.H., Wang, S., Saraogi, I., and Shan, S.* (2015) *Proc. Natl. Acad. Sci. U. S. A.*, 112: E3169-3178. Doi: 10.1073/pnas.1422594112. "Regulation by a chaperone improves substrate selectivity during cotranslational protein targeting". PMID: 26056263
62. von Loeffelholz, O., Jiang, Q., Ariosa, A., Karuppusamy, M., Huard, K., Berger, I., Shan, S.*, Schaffitzel, C.* (2015) *Proc. Natl. Acad. Sci. U. S. A.* 112: 3943-3948. Doi: 10.1073/pnas.1424453112 "Ribosome-SRP-FtsY cotranslational targeting complex in the closed state". PMCID: PMC4386334
61. Rome, M.E., Chio, U.S., Rao, M., Gristick, H.B., and Shan, S.* (2014) *Proc. Natl. Acad. Sci. U. S. A.*, 111: E4929-4935. "Differential gradients of interaction affinities drive efficient targeting and recycling in the GET pathway". PMCID: PMC4246279
60. Saraogi, I.*, Akopian, D., and Shan, S.* (2014) *J. Cell Biol.*, 205: 693-706. Doi: 10.1083/jcb.201311028. "Regulation of cargo recognition, commitment, and unloading drives cotranslational protein targeting". PMCID: PMC4050729
59. Zhang, X. and Shan, S.* (2014) *Annu. Rev. Biophys.*, 43: 381-408. Doi: 10.1146/annurev-biophys-051013-022653. "Fidelity of cotranslational protein targeting by the Signal Recognition Particle". PMCID: PMC4444370
58. Guo, H., Xiong, Y., Witkowski, P., Cui, J., Wang, L.J., Sun, J., Lara-Lemus, R., Haataja, L., Hutchison, K., Shan, S.*, Arvan, P.*, and Liu, M.* (2014) *J. Biol. Chem.*, 289: 16290-16302. Doi:

- 10.1074/jbc.M114.562355. “Inefficient translocation of preproinsulin contributes to pancreatic Beta Cell Failure and late onset diabetes.” PMID: PMC4047398
57. Gristick, H.B., Rao, M., Chartron, J.W., Rome, M.E., Shan, S., and Clemons, W.M.Jr.* (2014) *Nature Struct. Molec. Biol.*, 21: 437-442. “Crystal structure of ATP-bound Get3-Get4-Get5 complex reveals regulation of Get3 by Get4”. PMID: PMC4386898
56. Saraogi, I., and Shan, S.* (2014) *Biochim Biophys Acta.*, 1843: 1433-1441. Doi: 10.1093/femsle/fny095. “Co-translational protein targeting to the bacterial membrane.” PMID: PMC3999308
55. Loson, O.C., Liu, R., Rome, M.E., Meng, S., Kaiser, J.T., Shan, S.O. and Chan, D.C.* (2014) *Structure*, 22: 367-377. Doi: 10.1016/j.str.2014.01.001. “The mitochondrial fission receptor MiD51 requires ADP as a cofactor”. PMID: PMC4066849
54. Voigts-Hoffmann, F., Schmitz, N., Shen, K., Shan, S.O.*, Ataide, S.F.*, Ban, N.* (2013) *Mol. Cell*, 52: 643-54. “The structural basis of FtsY recruitment and GTPase activation by SRP RNA”. PMID: PMC3910249
53. Shen, K., Wang, Y., Hwang Fu, Y.H., Zhang, Q., Feigon, J., and Shan, S.* (2013) *J. Biol. Chem.*, 288: 36385-97. Doi: 10.1074/jbc.M113.513614. “Molecular Mechanism of GTPase activation at the signal recognition particle (SRP) RNA distal end”. PMID: PMC3868752
52. Rome, M., Rao, M., Clemons, W.M., and Shan, S.* (2013) *Proc. Natl. Acad. Sci. U. S. A.*, 110: 7666-7671. Doi: 10.1073/pnas.1222054110. “Precise timing of ATPase activation drives targeting of tail-anchored proteins”. PMID: PMC3651441
51. von Loeffelholz, O., Knoops, K., Ariosa, A., Zhang, X., Karuppasamy, M., Huard, K., Schoehn, G., Berger, I., Shan, S.*, Schaffitzel, C.* (2013) *Nature Struct. Mol. Biol.*, 20: 604-610. Doi: 10.1038/nsmb.2546. “Structural basis of signal sequence surveillance and selection by the SRP-SR complex”. PMID: PMC3874396
50. Nguyen, T.X., Jaru-Ampornpan, P., Lam, V.Q., Cao, P., Piszkiwicz, S., Hess, S., Shan, S.* (2013) *J. Biol. Chem.*, 288: 13420-13430. Doi: 10.1074/jbc.M113.462812. “Mechanism of an ATP-independent protein disaggregase. I. Structure of a membrane protein aggregate reveals a mechanism of recognition by its chaperone”. PMID: PMC3650380
49. Jaru-Ampornpan, P., Liang, F.C., Nisthal, A., Nguyen, T.X., Wang, P., Shen, K., Mayo, S.L., Shan, S.* (2013) *J. Biol. Chem.*, 288: 13431-13445. Doi: 10.1074/jbc.M113.462861. “Mechanism of an ATP-independent protein disaggregase. II. Distinct molecular interactions drive multiple steps during aggregate disassembly”. PMID: PMC3650381.
48. Akopian, D., Shen, K., Zhang, X. and Shan, S.* (2013) *Annu Rev. Biochem.* 82: 693-721. Doi: 10.1146/annurev-biochem-072711-164732. “Signal recognition particle: An essential protein targeting machine”. PMID: PMC3805129
47. Perice, N.W., Lee, J.E., Liu, X., Sweredoski, M.J., Graham, R.L., Larimore, E.A., Rome, M., Zheng, N., Cluman, B.E., Hess, S., Shan, S.O. ‡, Deshaies, R.J. ‡* (2013) *Cell* 153: 206-215. Doi: 10.1016/j.cell.2013.02.024. “Cand1 promotes assembly of new SCF complexes through dynamic exchange of F box proteins”. PMID: PMC3656483

‡These authors contributed equally to this work.

46. Akopian, D., Dalai, K., Shen, K., Duong, F., Shan, S.* (2013) *J. Cell Biol.* 200: 397-405. Doi: 10.1083/jcb.201208045. "SecYEG activates GTPases to drive the completion of cotranslational protein targeting". PMID: PMC3575545. **Highlight in:** *J. Cell Biol.* 200, p362 (2013).
45. Ariosa, A.R., Duncan, S.S., Saraogi, I., Lu, X., Brown, A., Phillips, G.J., and Shan, S.* (2013) *Mol. Biol. Cell*, 24: 63-73. "Fingerloop activates cargo delivery and unloading during cotranslational protein targeting". PMID: PMC3541965
44. Shen, K., Arslan, S., Akopian, D., Ha, T., and Shan, S.* (2012) *Nature* 492: 271-275. Doi: 10.1038/nature11726. "Activated GTPase movement on an RNA scaffold drives cotranslational protein targeting." PMID: PMC3531814. **News & Views on:** *Nature* 492: 271-275 (2012).
43. Liu, M.*, Lara-Lemus, R., Shan, S., Wright, J., Haataja, L., Barbetti, F., Guo, H., Larkin, D., Arvan, P. (2012) *Diabetes*, 61: 828-837. "Impaired cleavage of preproinsulin signal peptide linked to autosomal-dominant diabetes." PMID: PMC3314357
42. Zhang, D., and Shan, S.* (2012) *J. Biol. Chem.*, 287: 7652-7660. Doi: 10.1074/jbc.M111.325001. "Translation elongation regulates substrate selection by the Signal Recognition Particle." PMID: PMC3293578
41. Zhang, D., Sweredoski, M.J., Graham, R.L., Hess, S., Shan, S.* (2012) *Mol Cell Proteomics*, 11: M111.011585. Doi: 10.1074/mcp.M111.011585. "Novel proteomic tools reveal essential roles of SRP and importance of proper membrane protein biogenesis." PMID: PMC3277757
40. Saraogi, I., Akopian, D., and Shan, S.* (2011) *Protein Sci.*, 20:1790-5. Doi: 10.1002/pro.729. "A Tale of two GTPases in cotranslational protein targeting." PMID: PMC3267943
39. Saraogi, I., Zhang, D., Chandrasekaran, S., and Shan, S.* (2011) *JACS*, 133:14936-9. Doi: 10.1021/ja206626g. "Site-specific fluorescent labeling of nascent proteins on the translating ribosome". PMID: PMC3189723
38. Nguyen, T., Chandrasekar, S., Neher, S., Walter, P., and Shan, S.* (2011) *Biochemistry*, 50:7208-7217. Doi: 10.1021/bi200742a. "Concerted complex assembly and GTPase activation in the chloroplast signal recognition particle". PMID: 21780778
37. Zhang, X., Lam, V.Q., Mou, Y., Kimura, T., Chung, J., Chandrasekar, S., Winkler, J., Mayo, S.L., and Shan, S.* (2011) *Proc. Natl. Acad. Sci. U.S.A.*, 108: 6450-6455. "Direct visualization reveals dynamics of a transient intermediate during protein assembly". PMID: PMC3081034
36. Shen, K., Zhang, X., and Shan, S.* (2011) *RNA* 17: 892-902. Doi: 10.1261/rna.2610411. "Synergistic action between the SRP RNA and translating ribosome allows efficient delivery of correct cargos during co-translational protein targeting". PMID: PMC3078738
35. Saraogi, I., and Shan, S.* (2011) *Traffic* 12: 535-542. Doi: 10.1111/j.1600-0854.2011.01171.x. "Molecular mechanism of co-translational protein targeting by the Signal Recognition Particle". PMID: PMC3077218
34. Attaide, S.F., Schmitz, N. ‡, Shen, K. ‡, Ke, A., Shan, S., Doudna, J. A.*, and Ban, N.* (2011) *Science* 381, 881-886. Doi: 10.1126/science.1196473. "The crystal structure of the Signal Recognition Particle in complex with its receptor". PMID: 21330537

‡These authors contributed equally to this work.

33. Estrozi, L.F., Boehringer, D., Shan, S., Ban, N.*, and Schaffitzel, C.* (2011) *Nature Struct. Mol. Biol.* 18: 88-90. Doi: 10.1038/nsmb.1952. "Cryo-EM structure of the *E. coli* translating ribosome in complex with SRP and its receptor". PMID: 21544645
32. Lam, V.Q., Akopian, D., Rome, M., Shen, Y., Henningsen, D., and Shan, S.* (2010) *J. Cell Biol.* 190: 623-635. Doi: 10.1083/jcb.201004129. "Lipid activation of the signal recognition particle receptor provides spatial coordination of protein targeting". PMID: 20292810
31. Jaru-Ampornpan, P., Shen, K., Lam, V.Q., Ali, M., Doniach, S., Jia, T.Z., and Shan, S.* (2010) *Nature Struct. Mole. Biol.* 17, 696-702. Doi: 10.1038/nsmb.1836. "ATP-independent reversal of a membrane protein aggregate by a chloroplast SRP subunit". PMID: 20424608. **News & Views on:** *Struct. Mole. Biol.* 17: 676-677 (2010). PMID: 202917185
30. Zhang, X., Rashid, R., Wang, K., and Shan, S.* (2010) *Science* 328, p757-760. Doi: 10.1126/science.1186743. "Sequential checkpoints govern substrate selection during cotranslational protein targeting". PMID: 203760334
29. Shen, K., and Shan, S.* (2010) *Proc. Natl. Acad. Sci. U. S. A.* 107, 7698-7703. Doi: 10.1073/pnas.1002968107. "Transient tether between the SRP RNA and SRP receptor ensures efficient cargo delivery during cotranslational protein targeting". PMID: 202867919
28. Pierce, N., Kleiger, G., Shan, S. ‡, and Deshaies R.J. ‡* (2009) *Nature* 462, 615-619. Doi: 10.1038/nature08595. "Detection of sequential polyubiquitylation on a millisecond timescale". PMID: 192791906

‡These authors contributed equally to this work. **News & Views in:** *Nature* 462: 585-586 (2009).

27. Jaru-Ampornpan, P., Nguyen, T. X., and Shan, S.* (2009) *Mole. Biol. Cell* 20, 3965-3973. Doi: 10.1091/mbc.e08-10-0989. "A distinct mechanism to achieve efficient signal recognition particle (SRP)-SRP receptor interaction by the chloroplast SRP pathway". PMID: 192735494
26. Shan, S.*, Schmid, S.L., and Zhang, X. (2009) *Biochemistry* 48, 6696-6704. Doi: 10.1021/bi9006989. "Signal recognition particle (SRP) and SRP receptor: a new paradigm for multi-state regulatory GTPases". PMID: 192883566
25. Zhang, X., Schaffitzel, C., Ban, N., and Shan, S.* (2009) *Proc. Natl. Acad. Sci. U. S. A.* 106, 1754-1759. Doi: 10.1073/pnas.0808573106. "Multiple conformational switches in a GTPase complex control co-translational protein targeting". PMID: 192644110
24. Zhang, X., Kung, S., and Shan, S.* (2008) *J. Mol. Biol.* 381, 581-593. Doi: 10.1016/j.jmb.2008.05.049. "Demonstration of a multi-step mechanism for assembly of the SRP-SRP receptor complex: Implications for the catalytic role of SRP RNA". PMID: 182630804
23. Chandrasekar, S., Chartron, J., Jaru-Ampornpan, P., and Shan, S.* (2008) *J. Mol. Biol.* 375, 425-436. Doi: 10.1016/j.jmb.2007.09.061. "Structure of the chloroplast signal recognition particle (SRP) receptor: domain arrangement modulates the SRP-receptor interaction". PMID: 18035371
22. Shan, S.*, Chandrasekar, S., and Walter, P. (2007) *J. Cell Biol.* 178, 611-620. Doi: 10.1016/j.jmb.2007.09.061. "Conformational changes in the GTPase modules of the signal reception particle and its receptor drive initiation of protein translocation". PMID: 172064468
21. Jaru-Ampornpan, P., Chandrasekar, S., and Shan, S.* (2007) *Mol. Biol. Cell.* 18, 2636-2645. Doi: 10.1091/mbc.e07-01-0037. "Efficient interaction between two GTPases allows the chloroplast SRP pathway to bypass the requirement for an SRP RNA". PMID: 171924832

20. Shan, S.* and Walter, P. (2005) *Biochemistry* **44**, 6214-6222. "Molecular crosstalk between the nucleotide specificity determinant of the SRP GTPase and the SRP Receptor". PMID: 15835909
19. Shan, S. and Walter, P.* (2005) *FEBS Letters* **579**, 921-926. "Co-translational protein targeting by the signal recognition particle". PMID: 15680975
18. Chu, F., Shan, S., Moustakas, D.T., Alber, F., Egea, P., Stroud, R.M., Walter, P., and Burlingame, A.L.* (2004) *Proc. Natl. Acad. Sci. U. S. A.* **101**, 16454-16459. "Unraveling the interface of signal recognition particle and its receptor by using chemical cross-linking and tandem mass-spectrometry". PMCID: PMC528904
17. Shan, S.*, Stroud, R.M., and Walter, P. (2004) *PLOS Biology* **2**, e320. "Mechanism of association and reciprocal activation between two GTPases". PMCID: PMC517823
16. Egea, P.F., Shan, S., Napetschnig, J., Savage, D.F., Walter, P., and Stroud, R.M.* (2004) *Nature* **427**, 215-221. "Substrate twinning activates the signal recognition particle and its receptor". PMID: 14724630
15. Shan, S. and Walter, P.* (2003) *Proc. Natl. Acad. Sci. U. S. A.* **100**, 4480 – 4485. "Induced nucleotide specificity in a GTPase". PMCID: PMC153581
14. Shan, S., and Herschlag, D.* (2002) *RNA* **8**, 861-872. "Dissection of a metal-ion-mediated conformational change in *Tetrahymena* ribozyme catalysis". PMCID: PMC1370303
13. Peluso, P., Shan, S., Nock, S. Herschlag, D., and Walter, P.* (2001) *Biochemistry* **40**, 15224-15233. "Role of SRP RNA in the GTPase Cycles of Ffh and FtsY". PMID: 11735405
12. Shan, S., Kravchuk, A.V., Piccirilli, J.A., and Herschlag, D.* (2001) *Biochemistry* **40**, 5161-5171. "Defining the catalytic metal ion interactions in the *Tetrahymena* ribozyme catalysis". PMID: 11318638
11. Shan, S., and Herschlag, D.* (2000) *RNA* **6**, 795-813. "An unconventional origin of metal-ion rescue and inhibition in the *Tetrahymena* group I ribozyme reaction". PMID: 10864040
10. Yoshida, A.‡, Shan, S.‡, Herschlag, D., and Piccirilli, J.A.* (1999) *Chem. Biol.* **7**, 85-96. "The role of the cleavage site 2'-Hydroxyl in the *Tetrahymena* group I ribozyme reaction". PMID: 10662698

‡These authors contributed equally to this work.

9. Shan, S., Yoshida, A., Sun, S., Piccirilli, J.A. and Herschlag, D.* (1999) *Proc. Natl. Acad. Sci. U. S. A.* **96**, 12299-12304. "Three metal ions at the active site of the *Tetrahymena* group I ribozyme". PMID: 10535916
8. Shan, S., Narlikar, G.J. and Herschlag, D.* (1999) *Biochemistry* **38**, 10976-10988. "Protonated 2'-Aminoguanosine as a probe of the electrostatic environment of the active site of the *Tetrahymena* group I ribozyme". PMID: 10460152
7. Shan, S. and Herschlag, D.* (1999) *Biochemistry* **38**, 10958-10975. "Probing the role of metal ions in RNA catalysis: Kinetic and thermodynamic characterization of a metal ion interaction with the 2'-Moiety of the guanosine nucleophile in the *Tetrahymena* group I ribozyme". PMID: 10460151
6. Shan, S. and Herschlag, D.* (1999) in *Methods in Enzymology*, vol **308**, part E, ed. V. Schramm & D. L. Purich, Academic Press, New York. pp246-275. "Hydrogen bonding in enzymatic catalysis: Analysis of energetic contributions". PMID: 10507008

5. Shan, S. and Herschlag, D.* (1996) *Proc. Natl. Acad. Sci. U. S. A.* **93**, 14474-14479. "The change in hydrogen bond strength accompanying charge rearrangement: Implications for enzymatic catalysis". PMID: 8962076
4. Shan, S. and Herschlag, D.* (1996) *J. Am. Chem. Soc.* **118**, 5515-5518. "Energetic effects of multiple hydrogen bonds. Implications for enzymatic catalysis".
3. Shan, S., Loh, S. and Herschlag, D.* (1996) *Science* **272**, 97-101. "The energetics of hydrogen bonds in model systems. Implications for enzymatic catalysis". PMID: 8600542
2. Shan, S. and Armstrong, R.N.* (1994) *J. Biol. Chem.* **269**, 32373-32379. "Rational reconstruction of the active site of a Class Mu Glutathione S-Transferase".
1. Zhang, P., Liu, S., Shan, S., Ji, X., Gilliland, G.L. and Armstrong, R.N.* (1992) *Biochemistry* **31**, 10185-10193. "Modular mutagenesis of Exons 1, 2, and 8 of a Glutathione S-Transferase from the Mu Class: Mechanistic and structural consequences from Chimeras of Isoenzyme 3-3". PMID: 1420140