



Universiteit
Leiden
The Netherlands

Structural diversity of frameshifting signals : reprogramming the programmed

Yu, C.H.

Citation

Yu, C. H. (2011, December 22). *Structural diversity of frameshifting signals : reprogramming the programmed*. Retrieved from <https://hdl.handle.net/1887/18274>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/18274>

Note: To cite this publication please use the final published version (if applicable).

■

Structural Diversity of Frameshifting Signals

Reprogramming the Programmed

■

■

■

PROEFSCHRIFT

■

ter verkrijging van de graad van Doctor aan de Universiteit Leiden,

op gezag van de Rector Magnificus prof. mr. P.F. van der Heijden,

volgens besluit van het College voor Promoties

te verdedigen op donderdag 22 december 2011

te klokke 16.15 uur

■

■

door

■

■

Chien-Hung Yu

■

geboren te Nantou, Taiwan, in 1980

■

■

Promotiecommissie



Promotor

Prof. dr. M.H.M. Noteborn



Co-promotor

Dr. R.C.L. Olsthoorn



Overige leden

Prof. dr. B. Berkhout (Universiteit van Amsterdam)

Prof. dr. C.W.A. Pleij

Prof. dr. J. Brouwer

Prof. dr. J.P. Abrahams

Dr. A.P. Gultyaev



The front cover depicts the idea of the publication by J.-D. Wen *et al.* (J.-D., Wen *et al.*, 2008, *Nature*, **452**, 598-603) who used optical tweezers to monitor the translation of a single mRNA by an *E.coli* ribosome. It is astonishing that translation is not a continuous process but one of successive translocation and pause cycles. Understanding the details of the mechanism of translation in combination with atomic level structure of ribosomes may solve the thirty years old mystery of frameshifting. (Graphic by Laura Lancaster and Courtney Hodges, Berkeley Lab)



Contents

Chapter I	General introduction and outline	1
Chapter II	Structural diversity of RNA structures involved in programmed ribosomal frameshifting: a literature review	5
Chapter III	Stem-loop structures can effectively substitute for an RNA pseudoknot in -1 ribosomal frameshifting (<i>Nucleic Acids Res.</i> , 2011, 39 , 8952-8959)	39
Chapter IV	Stimulation of ribosomal frameshifting by antisense LNA (<i>Nucleic Acids Res.</i> , 2010, 38 , 7665-7672)	57
Chapter V	Antisense oligonucleotides that mimic a pseudoknot are highly efficient in stimulating -1 ribosomal frameshifting (Submitted to <i>Nucleic Acids Res.</i>)	73
Chapter VI	Comparison of preQ ₁ riboswitches by molecular dynamics simulations and ribosomal frameshifting: identification of a novel RNA-ligand interaction (Manuscript in preparation)	89
Chapter VII	General discussion	105
	Samenvatting	115
	Curriculum Vitae	120
	List of publications	121
	Acknowledgments	122

1
2
3
4
5
6
7
8

9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

101