

BIOGRAPHICAL SKETCH
Alexander van Oudenaarden

PROFESSIONAL PREPARATION

Delft University of Technology, The Netherlands	Materials Science and Engineering	M.S. 1993
Delft University of Technology, The Netherlands	Physics	M.S. 1993
Delft University of Technology, The Netherlands	Physics	Ph.D. 1998
Stanford University, Stanford, CA	Biophysics	1998 - 1999

APPOINTMENTS

09/2012 – present	Director Hubrecht Institute for Developmental Biology and Stem Cell Research, the Royal Netherlands Academy of Arts and Sciences (KNAW) and University Medical Center Utrecht, Utrecht, The Netherlands.
01/2013 – present	Professor, Faculty of Science, Utrecht University, Utrecht, The Netherlands.
09/2009 – present	Extramural faculty member of the Koch Institute for Integrative Cancer Research at MIT, Cambridge, MA, USA.
05/2009 – present	Professor of Biology Department of Biology, Massachusetts Institute of Technology, Cambridge, MA, USA.
07/2008 – present	Professor of Physics Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, USA.
06/2008 – 01/2009	Visiting Professor Hubrecht Institute for Developmental Biology and Stem Cell Research, Utrecht, The Netherlands.
07/2004 – 06/2008	Associate Professor of Physics with tenure Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, USA.
01/2000 – 06/2004	Assistant Professor of Physics Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, USA.
03/1998 – 12/1999	Postdoctoral research Department of Chemistry, Stanford University, Stanford, CA, USA. Laboratory of Prof. S.G. Boxer Micropatterning of supported phospholipid bilayers
03/1998 – 12/1999	Postdoctoral research Department of Biochemistry, Stanford, CA, USA. Laboratory of Prof. J.A. Theriot Force generation of polymerizing actin filaments

HONORS AND AWARDS

- 2012 European Research Council (ERC) Advanced Grant
- 2012 Dutch Organization for Scientific Research (NWO) Vici Award
- 2008 NIH Director's Pioneer Award
- 2008 Guggenheim Fellow
- 2007 School of Science Prize for Excellence in Graduate Teaching
- 2001 Keck Career Development Professor in Biomedical Engineering
- 2001 Alfred Sloan Research Fellow
- 2001 NSF CAREER award
- 2000 Edgerly Science Partnership Award
- 1998 Andries Miedema Award for best Ph.D.-research in the field of condensed matter physics in the Netherlands, awarded every other year by Fundamental Research on Matter (FOM).
- 1998 Dutch Organization for Scientific Research (NWO) TALENT stipendium.
- 1998 Ph.D. Applied Physics, *cum laude*.
- 1994 Award for best undergraduate research in Materials Science, yearly award by Delft University of Technology.
- 1993 M.S. Materials Science and Engineering, *cum laude*.

OTHER EXPERIENCE

- 01/2013 – present Member of the Scientific Advisory Board of the European Molecular Biology Laboratory (EMBL)
- 01/2012 – present Member of the Scientific Advisory Board of the Max Planck Institutes for Molecular Cell Biology and Genetics
- 09/2011 – present Member of the Scientific Advisory Board of the Whitehead Institute for Biomedical Research
- 10/2009 – 07/2012 Director of the MIT Center for Single-Cell Dynamics in Cancer (NIH/NCI funded U54 Physical Sciences-Oncology Center). The goal of this center is use both theoretical and experimental approaches inspired by Physics to attack important problems in cancer biology by developing novel technology and analytical/computational methods to track the dynamics of cancer at the single cell level.
- 06/2007 – 12/2011 Organizer of CSB (Computational and Systems Biology) seminar series.
- 01/2005 – 12/2007 Associate Editor *Biophysical Journal*
- 06/2004 – 07/2006 Course Faculty at the Marine Biology Laboratory (Woods Hole) Summer Course '*Physiology: Modern Cell Biology Using Microscopic, Biochemical and Computational Approaches*'
- 09/2002 – 12/2009 Lecturer and creator of MIT Graduate course 7.81/8.591/9.531 Systems Biology. This course is offered annually during the Fall semester. The course provides an introduction to the mathematical tools that are used to dynamically model gene and protein networks. The course is attended by about 60-70 Graduate students (about 50% having a background in biological sciences and 50% having a background in physical sciences).

PUBLICATION LIST

2013

Feedback control of gene expression variability in the *Caenorhabditis elegans* Wnt pathway,

N. Ji, T. C. Middelkoop, R. A. Mentink, M. C. Betist, S. Tonegawa, D. Mooijman, H. C. Korswagen, and A. van Oudenaarden,
Cell **155**, 869 – 880 (2013).

Highly expressed loci are vulnerable to misleading ChIP localization of multiple unrelated proteins,

L. Teytelman, D. M. Thurtle, J. Rine J, and A. van Oudenaarden,
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Dampening of expression oscillations by synchronous regulation of a microRNA and its target,

D. H. Kim, D. Gruen, and A. van Oudenaarden,
Nature Genetics, **45**, 1337 – 1344 (2013).

Single-molecule mRNA detection and counting in mammalian tissue,

A. Lyubimova, S. Itzkovitz, J. P. Junker, Z. P. Fan, X. Wu, and A. van Oudenaarden,
Nature Protocols **8**, 1743 – 1758 (2013).

Allele-specific detection of single mRNA molecules *in situ*,

C. H. Hansen and A. van Oudenaarden,
Nature Methods **10**, 869 – 871 (2013).

Stochastic cytokine expression induces mixed T helper cell states,

M. Fang, H. Xie, S. K. Dougan, H. Ploegh, and A. van Oudenaarden,
PLoS Biology **11**: e1001618. doi:10.1371/journal.pbio.1001618 (2013).

A physical sciences network characterization of non-tumorigenic and metastatic cells,
Physical Sciences - Oncology Centers Network,

Scientific Reports **3**:1449 doi: 10.1038/srep01449 (2013).

Systematic identification of signal-activated stochastic gene regulation,

G. Neuert, B. Munsky, R. Z. Tan, L. Teytelman, M. Khammash, A. van Oudenaarden,
Science **339**, 584 – 587 (2013).

Robustness and epistasis in the *C. elegans* vulval signaling network revealed by pathway dosage modulation,

M. Barkoulas, J. S. van Zon, J. Milloz, A. van Oudenaarden, and M. A. Félix,
Developmental Cell **24**, 64 – 75 (2013).

R. Z. Tan, N. Ji, R. A. Mentink, H. C. Korswagen, and A. van Oudenaarden,

Deconvolving the roles of Wnt ligands and receptors in sensing and amplification,
Molecular Systems Biology **9**:631 doi:10.1038/msb.2012.64 (2013).

M. Bienko, N. Crosetto, L. Teytelman, S. Klemm, S. Itzkovitz, and A. van Oudenaarden,
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Nature Methods **10**, 122 – 124 (2013).

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K. A. Peterson, Y. Nishi, W. Ma, A. Vedenko, L. Shokri, X. Zhang, M. McFarlane, J. M. Baizabal, J. P. Junker, A. van Oudenaarden, T. Mikkelsen, B. E. Bernstein, T. L. Bailey, M. L. Bulyk, W. H. Wong, and A. P. McMahon,
Neural-specific Sox2 input and differential Gli-binding affinity provide context and positional information in Shh-directed neural patterning,
Genes and Development **26**, 2802 – 2816 (2012).

N. Ji, and A. van Oudenaarden,
Single molecule fluorescent in situ hybridization (smFISH) of *C. elegans* worms and embryos,
WormBook, ed. The *C. elegans* Research Community, WormBook,
doi/10.1895/wormbook.1.153.1 (2012).

N. Barker, A. van Oudenaarden, and H. Clevers,
Identifying the stem cell of the intestinal crypt: strategies and pitfalls,
Cell Stem Cell **11**, 452 – 460 (2012).

J. H. van Es, T. Sato, M. van de Wetering, A. Lyubimova, A. N. Yee Nee, A. Gregorieff, N. Sasaki, L. Zeinstra, M. van den Born, J. Korving, A. C. Martens, N. Barker, A. van Oudenaarden, and H. Clevers,
Dll1(+) secretory progenitor cells revert to stem cells upon crypt damage,
Nature Cell Biology **14**, 1009 – 1104 (2012).

Y. Buganim, D. A. Faddah, A. W. Cheng, E. Itskovich, S. Markoulaki, K. Ganz, S. L. Klemm, A. van Oudenaarden, and R. Jaenisch,
Single-cell expression analyses during cellular reprogramming reveal an early stochastic and a late hierarchic phase,
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F. J. van Werven, G. Neuert, N. Hendrick, A. Lardenois, S. Buratowski, A. van Oudenaarden, M. Primig, and A. Amon,
Transcription of two long noncoding RNAs mediates mating-type control of gametogenesis in budding yeast,
Cell **150**, 1170 – 1181 (2012).

J. Munoz, D. E. Stange, A. G. Schepers, M. van de Wetering, B. Koo, S. Itzkovitz, R. Volckmann, K. S. Kung, J. Koster, S. Radulescu, K. Myant, R. Versteeg, O. J. Sansom, J. H. van Es, N. Barker, A. van Oudenaarden, S. Mohammed, A. J. R. Heck and H. Clevers,
The Lgr5 intestinal stem cell signature: robust expression of proposed quiescent '+4' cell markers,
EMBO Journal **31**, 3079 – 3091 (2012).

N. Slavov and A. van Oudenaarden,
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Molecular Cell **45**, 551 – 552 (2012).

J. Schneider, R. L. Skelton, S. E. Von Stetina, T. C. Middelkoop, A. van Oudenaarden, H. C. Korswagen, and D. M. Miller 3rd,
UNC-4 antagonizes Wnt signaling to regulate synaptic choice in the *C. elegans* motor circuit,
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J. Yu, M. T. Valerius, M. Duah, K. Staser, J. K. Hansard, J. J. Guo, J. McMahon, J. Vaughan, D. Faria, K. Georgas, B. Rumballe, Q. Ren, A. M. Krautzberger, J. P. Junker, R. D. Thiagarajan, P. Machanick, P. A. Gray, A. van Oudenaarden, D. H. Rowitch, C. D. Stiles, Q. Ma, S. M. Grimmond, T. L. Bailey, M. H. Little, and A. P. McMahon,
Identification of molecular compartments and genetic circuitry in the developing mammalian kidney,
Development **139**, 1863 – 1873 (2012).

B. Munsky, G. Neuert, and A. van Oudenaarden,
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N. Slavov, E. Airoidi, A. van Oudenaarden, and D. Botstein,
A conserved cell growth cycle can account for the environmental stress responses of divergent eukaryotes,
Molecular Biology of the Cell **23**, 1986 – 1997 (2012).

J. H. van Es, A. Haegbarth, P. Kujala, S. Itzkovitz, B. K. Koo, S. F. Boj, J. Korving, M. van den Born, A. van Oudenaarden, S. Robine, and H. Clevers,
A critical role for the Wnt effector Tcf4 in adult intestinal homeostatic self-renewal,
Molecular & Cellular Biology **32**, 1918 – 1927 (2012).

W. Guo, Z. Keckesova, J. L. Donaher, T. Shibue, V. Tischler, F. Reinhardt, S. Itzkovitz, A. Noske, U. Zürrer-Härdi, G. Bell, W. L. Tam, S. A. Mani, A. van Oudenaarden, and R. A. Weinberg,
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Cell **148**, 1015 – 1028 (2012).

J. P. Junker and A. van Oudenaarden,
When noisy neighbors are a blessing: analysis of gene expression noise identifies coregulated genes,
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S. Itzkovitz, I. C. Blat, T. Jacks, H. Clevers, and A. van Oudenaarden,
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Cell **148**, 608 – 619 (2012).

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S. Itzkovitz, A. Lyubimova, I. C. Blat, M. Maynard, J. van Es, J. Lees, T. Jacks, H. Clevers, and A. van Oudenaarden,
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Nature Cell Biology **14**, 106 – 114 (2012).

T. C. Middelkoop, L. Williams, P. T. Yang, M. C. Betist, N. Ji, A. van Oudenaarden, C. Kenyon, and H. C. Korswagen,
The thrombospondin repeat containing protein MIG-21 controls a left-right asymmetric Wnt signaling response in migrating *C. elegans* neuroblasts,
Developmental Biology **361**, 338 – 348 (2012).

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PLoS Genetics **7**, e1002418 (2011).

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Nature Genetics **43**, 854 – 859 (2011).

H. S. Seidel, M. Ailion, J. Li, A. van Oudenaarden, M. V. Rockman, and L. Kruglyak,
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PLoS Biology **9**, e1001115 (2011).

M. Harterink, D. H. Kim, T. C. Middelkoop, T. D. Doan, A. van Oudenaarden, and H. C. Korswagen,
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D. Hebenstreit, M. Fang, M. Gu, V. Charoensawan, A. van Oudenaarden, and S. A. Teichmann
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E. J. Steine, M. Ehrich, G. W. Bell, A. Raj, S. Reddy, A. van Oudenaarden, R. Jaenisch, and H. G. Linhart,
Genes methylated by DNA methyltransferase 3b are similar in mouse intestine and human colon cancer,
Journal of Clinical Investigation **121**, 1748 – S19 (2011).

S. Itzkovitz and A. van Oudenaarden,
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Nature Methods **8**, S12 – S19 (2011).

G. Balázsi, A. van Oudenaarden, and J. J. Collins,
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Cell **144**, 910 – 925 (2011).

I. Topalidou, A. van Oudenaarden, and M. Chalfie,
The *C. elegans* *aristaless/Arx* gene *alr-1* restricts variable gene expression,
Proc. Natl. Acad. Sci. USA **108**, 4063 – 4068 (2011).

2010

B. Pando and A. van Oudenaarden,
Coupling cellular oscillators - Circadian and cell division cycles in cyanobacteria,
Current Opinion in Genetics & Development, 20, 613 – 618 (2010).

H. Youk, A. Raj, and A. van Oudenaarden,
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Methods in Enzymology **470**, 429 – 446 (2010).

M. Acar, B. F. Pando, F. H. Arnold, M. B. Elowitz, and A. van Oudenaarden,
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Science **329**, 1656 – 1660 (2010).

H. Youk and A. van Oudenaarden,
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Nature **467**, 34 – 35 (2010).

R. Z. Tan and A. van Oudenaarden,
Transcript counting in single cells reveals dynamics of rDNA transcription,
Molecular Systems Biology **6**; doi:10.1038/msb.2010.14 (2010).

J. S. Tsang, M. S. Ebert, and A. van Oudenaarden,
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set signatures,
Molecular Cell **38**, 140 – 153 (2010).

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G. Dong, Q. Yang, Q. Wang, Y. Kim, T. Wood, K. W. Osteryoung, A. van Oudenaarden,
and S. S. Golden,
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Synechococcus elongates,
Cell **140**, 529 – 539 (2010).

A. Raj, S. A. Rifkin, E. Andersen, and A. van Oudenaarden,
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Nature **463**, 913 – 918 (2010).

2009

- H. Youk and A. van Oudenaarden,
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Nature **462**, 875 – 880 (2009).
- S. Mukherji and A. van Oudenaarden,
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Nature Review Genetics **10**, 859 – 871 (2009).
- J. Hanna, K. Saha, B. Pando, J. van Zon, C. J. Lengner, M. P. Creyghton, A. van Oudenaarden, and R. Jaenisch,
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Nature **462**, 595 – 603 (2009).
- D. Muzzey, C. Gomez-Urbe, J. T. Mettetal, and A. van Oudenaarden,
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Cell **138**, 160 – 171 (2009).
- D. Muzzey and A. van Oudenaarden,
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Annual Review of Cell and Developmental Biology **25**, 301 – 327 (2009).
- A. M. Khalil, M. Guttman, M. Huarte, M. Garber, A. Raj, D. Rivea Morales, K. Thomas, A. Presser, B. E. Bernstein, A. van Oudenaarden, A. Regev, E. S. Lander, and J. L. Rinn,
Many human large intergenic noncoding RNAs associate with chromatin-modifying complexes and affect gene expression,
Proc. Natl. Acad. Sci. USA **106**, 11667 – 11672 (2009).
- J. Gore, H. Youk, and A. van Oudenaarden,
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Nature **459**, 253 – 256 (2009).
- A. Raj and A. van Oudenaarden,
Single-molecule approaches to stochastic gene expression,
Annual Review of Biophysics **38**, 255 – 270 (2009).
- G. Liti, D. M. Carter, A. M. Moses, J. Warringer, L. Parts, S. A. James, R. P. Davey, I. N. Roberts, A. Burt, V. Koufopanou, I. J. Tsai, C. M. Bergman, D. Bensasson, M. J. O'Kelly, A. van Oudenaarden, D. B. Barton, E. Bailes, A. N. Nguyen, M. Jones, M. A. Quail, I. Goodhead, S. Sims, F. Smith, A. Blomberg, R. Durbin, and E. J. Louis,
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Nature **458**, 337 – 341 (2009).
- S. A. James, M. J. O'Kelly, D. M. Carter, R. P. Davey, A. van Oudenaarden, and I. N. Roberts,
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Genome Research **19**, 626 – 635 (2009).
- J. Gore and A. van Oudenaarden,
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Nature **457**, 271 – 273 (2009).

2008

A. Raj and A. van Oudenaarden,
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M. Acar, J. T. Mettetal, and A. van Oudenaarden,
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J. T. Mettetal, D. Muzzey, C. Gomez-Urbe, and A. van Oudenaarden,
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2007

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J. T. Mettetal and A. van Oudenaarden,
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Science **317**, 463 – 464 (2007).

B. B. Kaufmann, Q. Yang, J. T. Mettetal and A. van Oudenaarden,
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J. Tsang, J. Zhu, and A. van Oudenaarden,
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mammals,
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B. B. Kaufmann and A. van Oudenaarden,
Stochastic gene expression: from single molecules to the proteome,
Current Opinion in Genetics and Development **17**, 107 (2007).

H. N. Lim and A. van Oudenaarden,
A multistep epigenetic switch enables the stable inheritance of DNA methylation states,
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D. Muzzey and A. van Oudenaarden,
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Cell **126**, 650 (2006).

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J. Tsang and A. van Oudenaarden,
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J. T. Mettetal, D. Muzzey, J. M. Pedraza, E. M. Ozbudak, and A. van Oudenaarden,
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Proceedings of the National Academy of Sciences USA **103**, 7304 (2006).

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E. M. Ozbudak, A. Becskei, and A. van Oudenaarden,
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Developmental Cell **9**, 565 (2005).

A. Becskei, B. B. Kaufmann, and A. van Oudenaarden,
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M. Acar, A. Becskei, and A. van Oudenaarden,
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Nature **435**, 228 (2005).

J. M. Pedraza and A. van Oudenaarden,
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2004

A. Upadhyaya and A. van Oudenaarden,

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M. Thattai and A. van Oudenaarden,
Stochastic gene expression in fluctuating environments,
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A. Becskei, M. G. Boselli, and A. van Oudenaarden,
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Nature Cell Biology **6**, 451 (2004).

B. Nguyen, A. Upadhyaya, A. van Oudenaarden, and M. P. Brenner,
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2003

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A. Upadhyaya and A. van Oudenaarden,
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2002

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2001

M. Thattai and A. van Oudenaarden,
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Nature Cell Biology **1**, 493 (1999).

A. van Oudenaarden and S. G. Boxer,
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1998

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1997

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1996

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