Curriculum Vitae

ANDREW SEEBER, PhD

aseeber@fas.harvard.edu

Date of Birth: 28 October 1987 | Citizenship: South Africa/Ireland
Civil Status: Married to Michelle DiPietro (USA) | Residency: USA

PRESENT POSITION

Center for Advanced Imaging — Cambridge, USA
Harvard University — 9.2018 – present
John Harvard Distinguished Science Fellow in Imaging
My laboratory investigates chromatin dynamics and function

EDUCATION

Friedrich Miescher Institute for Biomedical Research — Basel, CH
University of Basel — 11.2011 – 1.2017
PhD, Genetics, summa cum laude
Dissertation: "*Chromatin dynamics in DNA double-strand break repair"*

University of Geneva — Geneva/Basel, CH
NCCR Frontiers in Genetics PhD rotation program — 10.2010 – 11.2011

Hong Kong University of Science and Technology — Kowloon, HK
NUIG Funded Exchange Fellowship — 1.2009 – 7.2009

National University of Ireland, Galway — Galway, IE
Bachelor of Biomedical Science, 1st Class Hons — 9.2006 – 6.2010

RESEARCH EXPERIENCE

Biozentrum Technology Venture — Basel, CH
University of Basel — 3.2018 – 7.2018
SNF BRIDGE and Gebert Rüf Stiftung Independent Researcher
Improving CRISPR-Cas9 efficiency by modulating chromatin structure

Center for Applied Biotechnology and Molecular Medicine, — Zurich, CH
University of Zurich — 8.2017 – 2.2018
SNF BRIDGE Independent Researcher
Hosted by Matthias Altmeyer
Improving CRISPR-Cas9 efficiency by modulating chromatin structure

Friedrich Miescher Institute for Biomedical Research — Basel, CH
PhD student; Advisor: Susan M. Gasser — 11.2011 – 6.2017
Chromatin dynamics in DNA double-strand break repair

- Developed an imaging regime to study chromatin dynamics in living cells
- Identified the biological mechanism that drives chromatin movement
- Characterized how sister chromatids are held together at double-strand breaks

Advanced Imaging Center, Janelia Research Campus — Ashburn, USA
Janelia Research Campus visitor program — 8.2015 – 9.2015
PhD student; Advisor: Teng-Leong Chew
Applying aberration-corrected multifocus microscopy to chromatin dynamics in budding yeast

Cold Spring Harbor Laboratory — NY, USA
Yeast Genetics and Genomics course — 7.2011 – 8.2011
Advisors: Prof. Jeffery Strathern and Prof. Jeffery S. Smith
Intensive training course in the use of S. cerevisiae as a model organism

Friedrich Miescher Institute for Biomedical Research — Basel, CH
3rd Rotation, NCCR Frontiers in Genetics — 5.2011 – 11.2011
Advisor: Prof. Susan M. Gasser
Interaction of the MRX complex with RPA at DSBs and stalled replication forks

University of Geneva — Geneva, CH
2nd Rotation, NCCR Frontiers in Genetics — 2.2011 – 5.2011
Advisor: Prof. David Shore
Sir protein interaction at an irreparable DSB

University of Geneva — Geneva, CH
1st Rotation, NCCR Frontiers in Genetics — 10.2010 – 2.2011
Advisor: Prof. Robbie Loewith
Investigation of downstream targets of yeast protein kinase

National University of Ireland, Galway — Galway, IE
Science Foundation Ireland Student Fellowship — 5.2010 – 9.2010
Advisor: Prof. Noel F. Lowndes
Investigation of the target residues of the tudor domains of 53Bp1 and Crb2

Diaceutics, International Management and Consulting Firm — Galway, IE
Advisor: Patrick Considine, PhD — 6.2010 – 9.2010
Creation of a database of patents, products and services of diagnostic companies

National University of Ireland, Galway — Galway, IE
Final Year Laboratory Project — 9.2009 – 1.2010
Advisor: Prof. Andrew Flaus
Recombinant expression and purification of histone H1.2 and its effect on a DNA-bound nucleosome

National University of Ireland, Galway — Galway, IE
Biochemical Society Summer Studentship — 6.2009 – 9.2009
Advisor: Prof. Heinz-Peter Hasheuer
Creation and recombinant expression of a trimeric mutant of replication protein A, in a single vector with a triple alanine mutation on the p32 subunit

SKILLS AND TECHNIQUES

- Genetic manipulations in budding yeast and human cells
- Chromatin immunoprecipitation and quantitative PCR
- Protein microarrays
- Co-immunoprecipitation of protein complexes
- Fluorescence microscopy
  - LSM and spinning disk microscopy
  - Structured illumination (SIM), PALM
  - FRET and FRAP
  - High content screening
- Image processing and analysis of large image datasets (ImageJ, KNIME, MATLAB, ICY)

LEADERSHIP EXPERIENCE

Friedrich Miescher Institute for Biomedical Research — Basel, CH
Graduate student advisor and microscopy expert — 2014-2016
Trained multiple graduate students in a range of techniques including live cell and super resolution microscopy and the use of S. cerevisiae as a model organism

The University of Hong Kong — Pok Fu Lam, HK
Anatomy demonstrator and prepared prosections — 1.2009 – 5.2009
Assisted in gross anatomical and histological laboratory practical sessions

National University of Ireland, Galway — Galway, IE
Vice Auditor of the Galway Film Society — 2008 – 2009

National University of Ireland, Galway — Galway, IE
Student Support Worker — 7.2007 – 5.2010
Tutoring students with learning disabilities (dyslexia) in biochemistry

GRANTS AND AWARDS

Gebert Rüf Foundation (388,649 CHF)	10.2017
SNF BRIDGE fellowship (130,000 CHF)	8.2017
Carl Singer Foundation award	8.2014
Biochemical Society travel grant	9.2011
Swiss Society for Biochemistry grant for junior scientists	8.2011
NCCR – Frontiers in Genetics, travel grant	8.2011
Science Foundation Ireland student fellowship	5.2010 – 9.2010
Biochemical Society Summer studentship	6.2009 – 9.2009
NUIG fellowship to Hong Kong University of Science and Technology	1.2009 – 7.2009

PROFESSIONAL ASSOCIATIONS

Member of the Biochemical Society (UK) — 2009 – present

INVITED CONFERENCE TALKS

Multiscale analysis and reconstruction of chromatin and nuclear organization, Pisa — 10.2018
"Chromosome Dynamics in Response to DNA Damage"

Research Center for the Mathematics on Chromatin Live Dynamics, Hiroshima — *"Using single-*

particle trajectory statistics and polymer simulations to analyze and predict changes in chromatin structure" 11.2016

39th Annual Meeting of the Molecular Biology Society of Japan 11.2016
"*Change in local chromatin structure during homology search"*

At the Intersection of DNA Replication and Genome Maintenance, ICGEB Trieste 6.2016
"RPA recruits MRX to forks and breaks to hold replicated sister chromatids together"

International Centre for Theoretical Physics Chromatin Workshop, Trieste 9.2014
"Chromatin (modifiers) and the dynamic chromatin response to DNA damage"

FASEB, Yeast Chromosome Structure, Replication and Segregation 7.2014
"Stable interaction between MRX and RPA is required for stalled fork recovery and maintenance of DSB structure for repair"

TriRhena transcription and chromatin club 2.2013
"Checkpoint kinases regulate global chromatin mobility after DSB induction"

Nucleosome 4D Barcelona Retreat 10.2012
"How checkpoint kinases influence global chromatin dynamics"

Image DDR meeting, Sussex 9.2012
"How checkpoint kinases influence global chromatin dynamics"

NCCR – Frontiers in Genetics Annual Meeting 6.2012
"How checkpoint kinases influence global chromatin dynamics"

PATENTS

Inventors: Seeber, A., Hauer, M., Gasser, S.M., 11.2016
"Methods for increasing the frequency of gene targeting by chromatin modification"

PEER-REVIEWED PUBLICATIONS

1) Chen, J., Young, S.M., Allen, C., **Seeber, A.**, Péli-Gulli, M.-P., Panchaud, N., Waller, A., Ursu, O., Yao, T., and Golden, J.E. (2012). Identification of a small molecule yeast TORC1 inhibitor with a multiplex screen based on flow cytometry. ACS Chemical Biology 7, 715-722.
2) Shimada, K., Filipuzzi, I., Stahl, M., Helliwell, S.B., Studer, C., Hoepfner, D., **Seeber, A.**, Loewith, R., Movva, N.R., and Gasser, S.M. (2013). TORC2 signaling pathway guarantees genome stability in the face of DNA strand breaks. Molecular Cell 51, 829-839.
3) Dion, V., Kalck, V., **Seeber, A.**, Schleker, T., and Gasser, S.M. (2013). Cohesin and the nucleolus constrain the mobility of spontaneous repair foci. EMBO reports 14, 984-991.
4) **Seeber, A.**, Dion, V., and Gasser, S.M. (2013). Checkpoint kinases and the INO80 nucleosome remodeling complex enhance global chromatin mobility in response to DNA damage. Genes & Development 27, 1999-2008.

5) Hustedt, N., **Seeber, A.**, Sack, R., Tsai-Pflugfelder, M., Bhullar, B., Vlaming, H., van Leeuwen, F., Guénolé, A., van Attikum, H., and Srivas, R. (2015). Yeast PP4 interacts with ATR homolog Ddc2-Mec1 and regulates checkpoint signaling. Molecular Cell 57, 273-289.

6) Poli, J., Gerhold, C.-B., Tosi, A., Hustedt, N., **Seeber, A.**, Sack, R., Herzog, F., Pasero, P., Shimada, K., and Hopfner, K.-P. (2016). Mec1, INO80, and the PAF1 complex cooperate to limit transcription replication conflicts through RNAPII removal during replication stress. Genes & Development 30, 337-354.

7) **Seeber, A.**, Hegnauer, A.M., Hustedt, N., Deshpande, I., Poli, J., Eglinger, J., Pasero, P., Gut, H., Shinohara, M., Hopfner, K.P., Shimada, K., Gasser, S.M. (2016) RPA Mediates Recruitment of MRX to Forks and Double-Strand Breaks to Hold Sister Chromatids Together. Molecular Cell 64, 951-966.

8) Hauer, M., **Seeber, A.**, Singh, V., Thierry, R., Amitai, A., Kryzhanovska, M., Eglinger, J., Holcman, D., Owen-Hughes, T. (2017) Histone degradation in response to DNA damage enhances chromatin dynamics and recombination rates. Nature Structural and Molecular biology 24, 99-107.

9) Amitai, A.*, **Seeber, A.***, Gasser, S.M., Holcman, D. (2017) Single particle trajectory statistics and polymer simulations model and accurately predict changes in chromatin structure at DNA breaks. Cell Rep 18, 1200-1214.
*equal contribution

10) Deshpande, I., **Seeber, A.**, Shimada, K., Keusch. J., Gut, H., Gasser, S.M. (2017) Structural basis of Mec1-Ddc2-RPA assembly and activation on single-stranded DNA at sites of damage. Mol Cell, 68, 431-445

11) Marcomini, I, Shimada, K, Delgoshaie, N, Yamamoto, I, **Seeber, A**, Cheblal, A, Horigome, C, Naumann, U, Gasser, S.M. (2018) Asymmetric Processing of DNA Ends at a Double-Strand Break Leads to Unconstrained Dynamics and Ectopic Translocation. Cell Rep, 24, 2614-2628

12) Cheblal, A., **Seeber, A.**, Gasser, S.M. Kinetochore detachment or declustering is not responsible for damage induced chromatin movement. *In preparation.*

13) Shimda, K., Gerhold, C.B., Yamasaki, S., Hurst, V., **Seeber, A.**, Filipuzzi, I., Stahl, M., Bodenmiller, B., Helliwell, S.B., Knapp, B., Loewith, R., Movva, R., Harata, M., Gasser, S.M. Modulation of actin distribution and polymerization dynamics impairs DNA damage repair. *In preparation.*

14) Poli, J., Barthe, A., Tittel-Elmer, M., Soutourina, J., **Seeber, A.**, Dubrana, K., Wery, M., Werner, M., Cobb, J., Gasser, S.M., Pasero, P., Legronne, A. MRX and mediator limit pervasive transcription through chromatin compaction at the nuclear pore complex. *In preparation.*
*equal contribution

REVIEW ARTICLES AND BOOK CHAPTERS

1) Chen, J., Young, S.M., Allen, C., Waller, A., Ursu, O., Strouse, J.J., Yao, T., Golden, J.E., Peterson, B.R., Foutz, T.D.,… **Seeber, A.,** et al. (2010). Profiling a Selective Probe for RTG Branch of Yeast TORC1 Signaling Pathway. Probe Reports from the NIH Molecular Libraries Program

2) **Seeber, A.**, Hauer, M., and Gasser, S.M. (2013). Nucleosome remodelers in double-strand break repair. Current Opinion in Genetics & Development 23, 174-184.

3) **Seeber, A.**, Dion, V., and Gasser, S.M. (2014). Remodelers move chromatin in response to DNA damage. Cell Cycle 13, 877-878.

4) Horigome, C., Dion, V., **Seeber, A.**, Gehlen, L.R., and Gasser, S.M. (2015). Visualizing the spatiotemporal dynamics of DNA damage in budding yeast. Methods in Molecular Biology (Clifton, NJ) 1292, 77-96.

5) **Seeber, A.**, and Gasser, S.M. (2017). Chromatin organization and dynamics in double-strand break repair. Current Opinion in Genetics & Development 43, 9-16.

6) **Seeber, A.**, Hauer, M., Gasser, S.M., (2018). Chromosome Dynamics in Response to DNA Damage. Annual Review of Genetics 52.

REFERENCES

Susan M. Gasser, PhD
Director of FMI
Professor of Molecular Biology
Quantitative Biology
FMI
Maulbeerstrasse 66
4058 Basel
Switzerland
susan.gasser@fmi.ch

Noel F. Lowndes, PhD
Professor of Biochemistry
Biochemistry
NUI, Galway
Galway
Ireland
noel.lowndes@nuigalway.ie

Vincent Dion, PhD
SNF Professor
CIG
University of Lausanne
Lausanne
Switzerland
vincent.dion@unil.ch