Collaborative Research Centre 1064

Chromatin Dynamics

Sonderforschungsbereich 1064

Chromatindynamik

der

Ludwig-Maximilians-Universität

München

Final report

2013/2 – 2025/1

Public Part

Collaborative Research Centre 1064

Chromatin Dynamics

Ludwig-Maximilians-Universität München

FINAL REPORT – Public Part

DFG reference number:	Collaborative Research Centre SFB 1064
Project number:	213249687
Title:	Chromatin Dynamics
Applicant university/universities:	Ludwig-Maximilians-Universität
Name of the spokesperson:	Prof. Dr. Peter B. Becker
Official address of the spokesperson:	Lehrstuhl Molekularbiologie Biomedizinisches Centrum Großhaderner Strasse 9 82152 Martinsried/Planegg
Reporting period (entire funding period):	01.10.2013 – 30.06.2025

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1 Summary

The genomes of eukaryotes are packaged in the cells' nuclei in a complex structure termed 'chromatin'. Chromatin fibers consist of nucleosomes, molecular spools made of histone proteins around which DNA is wound, as well as numerous other proteins, and non-coding RNA. In addition to its function to condense the DNA, the local organisation of chromatin regulates all genome functions.

The CRC focused on fundamental aspects of chromatin biology. It aimed at understanding principles and mechanisms that endow chromatin structure with diversity, plasticity and flexibility to respond to developmental, environmental and metabolic cues. The research strove for an integrated understanding of chromatin structure and function, involving identification and biochemical characterization of enzymes and metabolites, multi-omic analyses and imaging of cells in diverse physiological states and during ontogeny of model organisms. The CRC relied heavily on model systems.

During the **first funding period** (2013 – 2017), the CRC focused on **mechanisms**, covering three major areas. The focus on 'Nucleosome Remodelling' included structure and mechanism of nucleosome remodelling ATPases, their roles in histone variant exchange, nucleosome positioning and nucleosome spacing as a prerequisite for the functional organisation of chromatin. A second area dealt with histone modifications and histone variants. The research involved all aspects of reversible chemical modification of histones and their replacement by structural histone variants. The focus also dealt with histone dynamics associated with the process of transcription through chromatin, including histone chaperones that facilitate transcription elongation and reinstall the integrity of chromatin in the wake of the transcription. A third area considered the dynamic aspects of chromatin organisation that were traditionally considered very stable, including structures formed by classical heterochromatin proteins or Polycomb group repressors, as well as dynamic reversal of DNA methylation.

These three mechanistic themes were maintained throughout the lifetime of the CRC, but in each further funding period additional viewpoints were introduced to create new networking and collaboration opportunities.

During the **second funding period** (2017 – 2021), the CRC highlighted three chromatin-based **processes** that are subject to chromatin regulation: the transcription of genes, the replication of chromosomes and the maintenance of genome integrity. During the **third funding period** (2021 – 2025) two overarching **transversal themes** were introduced. One transversal theme involved '**time lines'** in chromatin dynamics, where we consider mechanisms of reversible transitions ('turnover'), irreversible emergence of stable states ('trajectory') and cyclical dynamics ('cycle'). A second transversal theme considered various intersections between local chromatin organisation and cell metabolism.

1 Zusammenfassung

Die Genome von Eukaryoten sind in den Zellkernen in einer komplexen Struktur namens „Chromatin“ verpackt. Chromatinfasern bestehen aus Nukleosomen, molekularen Spulen aus Histonproteinen, um die sich die DNA windet, sowie zahlreichen anderen Proteinen und nichtkodierender RNA. Zusätzlich zu ihrer Funktion, die DNA zu verdichten, reguliert die lokale Organisation des Chromatins alle Genomfunktionen.

Der CRC konzentrierte sich auf grundlegende Aspekte der Chromatinbiologie. Ziel war, die Prinzipien und Mechanismen zu verstehen, die der Chromatinstruktur Diversität, Plastizität und Flexibilität verleihen, um auf Entwicklungs-, Umwelt- und Stoffwechselreize zu reagieren. Die Forschung strebte ein integriertes Verständnis der Chromatinstruktur und -funktion an, einschließlich der biochemischen Charakterisierung von Enzymen und Metaboliten, Multi-Omic-Analysen und Bildgebung von Zellen in verschiedenen physiologischen Zuständen und während der Ontogenese von Modellorganismen. Der SFB stützte sich stark auf Modellsysteme.

Während der **1. Förderperiode (2013–2017)** konzentrierte sich das SFB auf **Mechanismen** in drei Bereichen. Der Schwerpunkt „Nukleosom- Remodeling ” umfasste die Struktur und den Mechanismus von Nukleosom-Remodeling-ATPasen, ihre Rolle beim Austausch von Histonvarianten, der Positionierung und Ausrichtung von Nukleosomen als Voraussetzung für die funktionelle Organisation von Chromatin. Ein zweiter Bereich umfasste Aspekte der reversiblen chemischen Modifikation von Histonen und deren Ersatz durch strukturelle Histonvarianten. Ein Schwerpunkt lag auf der Histondynamik im Zuge der Transkription, und Faktoren, die die Transkriptionsverlängerung erleichtern oder die Integrität des Chromatins nach der Transkription wiederherstellen. Ein dritter Bereich befasste sich mit dynamischen Aspekten der Chromatinorganisation, in Bereichen, die traditionell als sehr stabil galten, wie das konstitutive und fakultative Heterochromatin, sowie die dynamische Umkehrung der DNA-Methylierung.

Diese drei mechanistischen Themen wurden während der gesamten Laufzeit des CRC beibehalten, aber in jeder weiteren Förderperiode wurden zusätzliche Blickwinkel eingeführt, um neue Vernetzungs- und Kooperationsmöglichkeiten zu schaffen.

Während der **zweiten Förderperiode (2017–2021)** konzentrierte sich das CRC auf drei Chromatin-basierte **Prozesse**, die der Chromatinregulation unterliegen: die Transkription von Genen, die Replikation von Chromosomen und die Aufrechterhaltung der Genomintegrität. In der **dritten Förderperiode (2021–2025**) wurden zwei übergreifende **transversale Themen** eingeführt. Ein Querschnittsthema betraf Zeitverläufe in der Chromatindynamik, wobei wir Mechanismen reversibler Übergänge („Turnover“), irreversibler Entstehung stabiler Zustände („Trajektorie“) und zyklischer Dynamik („Zyklus“) betrachteten. Ein zweites Querschnittsthema befasste sich mit verschiedenen Schnittstellen zwischen lokaler Chromatinorganisation und Zellstoffwechsel.

2 Selection of the most important published results

CRC Investigators published 310 peer-reviewed papers, in which support by the CRC is acknowledged. About a third of these papers document a collaboration as more than one CRC investigator (bold) contributed (28% collaborative papers). Among the works are 51 methods/review publications. Below we list a selection of 50 publications which we consider particularly impactful, highlighting the achievements of all CRC groups.

2.1 Publications with scientific quality assurance

1. Gambetta MC, **Müller J** (2014).
O-GlcNAcylation prevents aggregation of the Polycomb group repressor Polyhomeotic.
Dev Cell 31: 629-639. doi: 10.1016/j.devcel.2014.10.020.

2. Baejen C, Torkler P, Gressel S, Essig K, Söding, **Cramer P** (2014).
Transcriptome maps of mRNP biogenesis factors define pre-mRNA recognition.
Mol Cell 55: 745-57. doi:10.1016/j.molcel.2014.08.005.

3. Schüller R, Forne I, **Straub T**, Schreieck A, Texier Y, Shah N, Decker TM, **Cramer P**, **Imhof A**, **Eick D** (2016). Heptad-Specific Phosphorylation of RNA Polymerase II CTD.
Mol Cell 61: 305–314. doi: 10.1016/j.molcel.2015.12.003.

4. Krietenstein N, Wal M, Watanabe S, Park B, Peterson CL, Pugh BF, **Korber P** (2016).
Genomic Nucleosome Organization Reconstituted with Pure Proteins.
Cell 167: 709-721.e12. doi: 10.1016/j.cell.2016.09.045.

5. Barrales RR, Forn M, Georgescu PR, Sarkadi Z, **Braun S** (2016)
Control of heterochromatin localization and silencing by the nuclear membrane protein Lem2.
Genes Dev 30:133-48. doi: 10.1101/gad.271288.115.

6. Laprell F, Finkl K, **Müller J** (2017). Propagation of Polycomb repressed chromatin requires sequence-specific recruitment to DNA.
Science 356: 85-88. doi 10.1126/science.aai8266.

7. Pünzeler S, et al., **Straub T**, et al., **Leonhardt H**, Mann M, **Rupp RA**, **Hake SB** (2017).
Multivalent binding of PWWP2A to H2A.Z regulates mitosis and neural crest differentiation.
EMBO J 36: 2263-2279. doi: 10.15252/embj.201695757.

8. Singh HR, et al., **Mueller-Planitz F**, et al., **Ladurner AG** (2017). A Poly-ADP-Ribose Trigger Releases the Auto-Inhibition of a Chromatin Remodeling Oncogene.
Mol Cell 68: 860-871.e7. doi: 10.1016/j.molcel.2017.11.019.

9. Baldi S, Jain DS, Harpprecht L, Zabel A, Scheibe M, Butter F, **Straub T**, **Becker PB** (2018).
Genome-wide Rules of Nucleosome Phasing in Drosophila.
Mol Cell 72: 661-672. doi: 10.1016/j.molcel.2018.09.032.

10. Baldi S, Krebs S, Blum H, **Becker PB** (2018). Genome-wide measurement of local nucleosome array regularity and spacing by nanopore sequencing.
Nat Struct Mol Biol 9: 894-901. doi: 10.1038/s41594-018-0110-0.

11. Eustermann S, Schall K, Kostrewa D, Lakomek K, Strauss M, Moldt M, **Hopfner KP** (2018).
Structural basis for ATP-dependent chromatin remodelling by the INO80 complex.
Nature 556: 386-390. doi: 10.1038/s41586-018-0029-y.

12. Knoll KR, et al., **Korber P**, **Hopfner KP** (2018). The nuclear actin-containing Arp8 module is a linker DNA sensor driving INO80 chromatin remodeling.
Nat Struct Mol Biol 25: 823-832. doi: 10.1038/s41594-018-0115-8.

13. Cernilogar FM, et al., **Schotta G** (2019). Pre-marked chromatin and transcription factor co-binding shape the pioneering activity of Foxa2.
Nucleic Acids Res 47: 9069-9086. doi:10.1093/nar/gkz627.

14. Bonnet J, et al., **Rupp RAW**, Gagneur J, Vermeulen M, **Imhof A**, **Müller J** (2019). Quantification of proteins and histone marks in Drosophila embryos reveals stoichiometric relationships impacting chromatin regulation.
Dev Cell 51: 632-644. doi: 10.1016/j.devcel.2019.09.011.

15. Murawska M, et al., **Straub T**, **Ladurner AG** (2020). The Chaperone FACT and Histone H2B Ubiquitination Maintain S.pombe Genome Architecture through Genic and Subtelomeric Functions.
Mol Cell 77: 501-513.e7. doi: 10.1016/j.molcel.2019.11.016.

16. Oberbeckmann E, Wolff M, Krietenstein N, Heron M, Ellins JL, Schmid A, Krebs S, Blum H, Gerland U**, Korber P** (2019). Absolute nucleosome occupancy map for the the Saccharomyces cerevisiae genome.
Genome Res 29: 1996-2009. doi: 10.1101/gr.253419.119.

17. Scacchetti A, Schauer T, et al., Wierer M, **Becker PB** (2020).
Drosophila SWR1 and NuA4 complexes are defined by DOMINO isoforms.
Elife 9: e56325. doi: 10.7554/eLife.56325.

18. Bheda P, et al., **Schneider R** (2020). Single-Cell Tracing Dissects Regulation of Maintenance and Inheritance of Transcriptional Reinduction Memory.
Mol Cell 78: 915-925. doi: 10.1016/j.molcel.2020.04.016.

19. Ignatova VV, et al., **Bultmann S**, **Schneider R** (2020). The rRNA m6A methyltransferase METTL5 is involved in pluripotency and developmental programs.
Genes Dev 34: 715-729. doi: 10.1101/gad.333369.119.

20. Burton A, et al., **Torres-Padilla ME** (2020). Heterochromatin establishment during early mammalian development is regulated by pericentromeric RNA and characterized by non-repressive H3K9me3.
Nat Cell Biol 22: 767-778. doi: 10.1038/s41556-020-0536-6.

21. Kochanova NY, et al., **Schepers A**, Thomae AW, **Imhof A** (2020). A multi-layered structure of the interphase chromocenter revealed by proximity-based biotinylation.
Nucleic Acids Res 225: 4161-4178. doi: 10.1093/nar/gkaa145.

22. Greulich F, Wierer M, Mechtidou A, Gonzalez-Garcia O, **Uhlenhaut NH** (2021). The glucocorticoid receptor recruits the COMPASS complex to regulate inflammatory transcription at macrophage enhancers.
Cell reports 34: 108742. https://doi.org/10.1016/j.celrep.2021.108742.

23. Blessing C, Mandemaker IK, Gonzalez-Leal C, Preisser J, Schomburg A, **Ladurner AG** (2020). The Oncogenic Helicase ALC1 Regulates PARP Inhibitor Potency by Trapping PARP2 at DNA Breaks.
Mol Cell 80: 862-875. doi: 10.1016/j.molcel.2020.10.009.

24. Mulholland CB, et al., **Leonhardt H**, **Bultmann S** (2020). Distinct and stage-specific contributions of TET1 and TET2 to stepwise cytosine oxidation in the transition from naive to primed pluripotency.
Sci Rep 10: 12066. doi: 10.1038/s41598-020-68600-3.

25. Nakatani T, et al., **Torres-Padilla ME** (2022). DNA replication fork speed underlies cell fate changes and promotes reprogramming.
Nat Genet 54: 318-327. doi: 10.1038/s41588-022-01023-0.

26. Lukacs A, Thomae AW, Krueger P, Schauer T, Venkatasubramani AV, Kochanova NY, Aftab W, Choudhury R, Forne I, **Imhof A** (2021). The Integrity of the HMR complex is necessary for centromeric binding and reproductive isolation in Drosophila.
PLoS Genet 17: e1009744. doi: journal.pgen.1009744.

27. Pokrovsky D, Forné I, **Straub T, Imhof A**, **Rupp RAW** (2021). A systemic cell cycle block impacts stage-specific histone modification profiles during Xenopus embryogenesis.
PLoS Biol 19: e3001377. doi: 10.1371/journal.pbio.3001377.

28. Peritore M, Reusswig KU, Bantele S**, Straub T**, **Pfander B**. (2021).
Strand-specific ChIP-seq at DNA breaks distinguishes single versus double-stranded DNA binding and refutes single-stranded nucleosomes.
Mol Cell 81: 841-1853.doi: 10.1016/j.molcel.2021.02.005.

29. Capella M, Mandemaker IK, Caballero LM, den Brave F, **Pfander B**, **Ladurner AG**, Jentsch S, **Braun S** (2021). Nucleolar release of rDNA repeats for repair involves SUMO-mediated untethering by the Cdc48/p97 segregase.
Nat Commun 12: 4918. doi: 10.1038/s41467-021-25205-2.

30. Buschle A, et al., **Schotta G**, **Straub T**, **Hammerschmidt W** (2021).
Epstein-Barr virus inactivates the transcriptome and disrupts the chromatin architecture of its host cell in the first phase of lytic reactivation.
Nucleic Acids Res 49: 3217-3241. doi: 10.1093/nar/gkab099.

31. Leidescher S, et al., **Bultmann S**, et al., **Leonhardt H**, Mirny L, Solovei I (2022).
Spatial organization of transcribed eukaryotic genes.
Nat Cell Biol 24: 327-339. doi: 10.1038/s41556-022-00847-6.

32. Wang Z, et al., **Leonhardt H**, Lickert H, **Schotta G** (2022).
Dominant role of DNA methylation over H3K9me3 for IAP silencing in endoderm.
Nat Commun 13: 5447. doi: 10.1038/s41467-022-32978-7.

33. Martín Caballero L, et al., **Braun S** (2022). The inner nuclear membrane protein Lem2 coordinates RNA degradation at the nuclear periphery.
Nat Struct Mol Biol 29:910-921. doi: 10.1038/s41594-022-00831-6

34. Vizjak P, et al., **Becker PB**, **Smolle M**, Stigler J, **Mueller-Planitz F** (2024).
ISWI catalyzes nucleosome sliding in condensed nucleosome arrays.
Nat Struct Mol Biol 31: 1331-1340. doi: 10.1038/s41594-024-01290-x.

35. Stolz P, et al., **Schneider R**, **Bartke T**, **Leonhardt H**, Elsässer SJ, **Bultmann S** (2024). TET1 regulates gene expression and repression of endogenous retroviruses independent of DNA demethylation.
Nucleic Acids Res 50: 8491-8511. doi: 10.1093/nar/gkac642.

36. Weiβ M, et al., **Hamperl S** (2023). Single-copy locus proteomics of early- and late-firing DNA replication origins identifies a role of Ask1/DASH complex in replication timing control. *Cell Rep* 42: 112045. doi: 10.1016/j.celrep.2023.112045.

37. Zhang M, et al., **Hopfner KP**, Eustermann S (2023).
exasome-INO80 complex reveals structural basis of noncanonical nucleosome remodeling. *Science* 381: 313-319. doi: 10.1126/science.adf6287.

38. Ugur E, de la Porte A, Qin W, **Bultmann S**, Ivanova A, Drukker M, Mann M, Wierer M, **Leonhardt H** (2023). Comprehensive chromatin proteomics resolves functional phases of pluripotency and identifies changes in regulatory components.
Nucleic Acids Res 51: 2671-2690. doi: 10.1093/nar/gkad058.

39. Chacin E, Reusswig KU, Furtmeier J, Bansal P, Karl LA, **Pfander B**, **Straub T**, **Korber P**, **Kurat** CF (2023). Establishment and function of chromatin organization at replication origins. *Nature* 616: 836-842. doi: 10.1038/s41586-023-05926-8.

40. Rabuffo C, et al., **Siegel TN** (2024). Inter-chromosomal transcription hubs shape the 3D genome architecture of African trypanosomes.
Nat Commun 15: 10716. doi: 10.1038/s41467-024-55285-9.

41. Keneskhanova Z, et aL. Colomé-Tatché M, **Siegel TN** (2025).
Genomic determinants of antigen expression hierarchy in African trypanosomes.
Nature 642: 182-190. doi: 10.1038/s41586-025-08720-w.

42. Lukauskas S, et al., **Schneider R**, **Bartke T** (2024).
Decoding chromatin states by proteomic profiling of nucleosome readers.
Nature 627: 671-679. doi: 10.1038/s41586-024-07141-5.

43. Al-Refaie N, et al., **Cabianca DS** (2024).
Fasting shapes chromatin architecture through an mTOR/RNA Pol I axis.
Nat Cell Biol 26: 1903-1917. doi: 10.1038/s41556-024-01512-w.

44. Nakatani T, Schauer T, et al., Gilbert DM, **Torres-Padilla ME** (2024).
Emergence of replication timing during early mammalian development.
Nature 625: 401-409. doi: 10.1038/s41586-023-06872-1.

45. Carnie CJ, et al., **Stingele J** (2024).
Transcription-coupled repair of DNA-protein cross-links depends on CSA and CSB.
Nat Cell Biol. 26: 797-810. doi: 10.1038/s41556-024-01391-1.

46. Oomen ME, et al., **Torres-Padilla ME** (2025). An atlas of transcription initiation reveals regulatory principles of gene and transposable element expression in early mammalian development.
Cell 188: 1156-1174.e20. doi: 10.1016/j.cell.2024.12.013.

47. Pal M, Schauer T, Burton A, Nakatani T, Pecori F, Hernández-Giménez A, Nadelson I, Marti-Renom MA, **Torres-Padilla ME** (2025).The establishment of nuclear organization in mouse embryos is orchestrated by multiple epigenetic pathways.
Cell 188: 3583-3602.e21. doi: 10.1016/j.cell.2025.03.044.

48. Zikmund T, et al., **Hamperl S**, Scialdone A, **Hoermanseder E** (2025).
Differentiation success of reprogrammed cells is heterogeneous in vivo and modulated by somatic cell identity memory.
Stem Cell Reports 20: 102447. doi: 10.1016/j.stemcr.2025.102447.

49. Schmidt T, et al., **Stricker SH** (2025). Efficient DNA- and virus-free engineering of cellular transcriptomic states using dCas9 ribonucleoprotein (dRNP)-complexes.
Nucleic Acids Res 53: gkaf235. doi: 10.1093/nar/gkaf235.

50. Langstein-Skora I, et al., **Bartke T**, **Hopfner KP**, Gerland U, **Korber P** and Holehouse AS. (2025) Sequence- and chemical specificity define the functional landscape of intrinsically disordered regions. *Nat Cell Biol* accepted

2.2 Selected review articles of high impact

Members of the CRC have written authoritative review articles, of which a small selection is presented here. These articles are usually per-reviewed.

Timinszky G, **Ladurner AG** (2014). PARP1 and CBP lose their footing in cancer.
Nat Struct Mol Biol. 21: 947-8. doi: 10.1038/nsmb.2913

Baldi S**, Korber P, Becker PB** (2020). Beads on a string-nucleosome array arrangements and folding of the chromatin fiber.
Nat Struct Mol Biol. 2:109-118. doi: 10.1038/s41594-019-0368-x

Blessing C, Knobloch G, **Ladurner AG** (2020). Restraining and unleashing chromatin remodelers - structural information guides chromatin plasticity.
Curr Opin Struct Biol. 65:130-138. doi: 10.1016/j.sbi.2020.06.008.

Scacchetti A, **Becker PB** (2021).Variation on a theme: Evolutionary strategies for H2A.Z exchange by SWR1-type remodelers.
Curr Opin Cell Biol. 70:1-9. doi: 10.1016/j.ceb.2020.10.014.

Hermant C, **Torres-Padilla ME** (2021). TFs for TEs: the transcription factor repertoire of mammalian transposable elements.
Genes Dev. 35:22-39. doi: 10.1101/gad.344473.120

Millán-Zambrano G, Burton A, Bannister AJ, **Schneider R** (2022). Histone post-translational modifications - cause and consequence of genome function.
Nat Rev Genet. 9:563-580. doi: 10.1038/s41576-022-00468-7.

Barcons-Simon A, Carrington M, **Siegel TN** (2023). Decoding the impact of nuclear organization on antigenic variation in parasites.
Nat Microbiol. 8:1408-1418. doi: 10.1038/s41564-023-01424-9.

Pudelko L, **Cabianca DS**. (2024). The influencers' era: how the environment shapes chromatin in 3D. *Curr Opin Genet Dev*. 85:102173. doi: 10.1016/j.gde.2024.102173.

Burton A, **Torres-Padilla ME** (2025). Epigenome dynamics in early mammalian embryogenesis. *Nat Rev Genet*. 26:587-603. doi: 10.1038/s41576-025-00831

Cordes J, Zhao S, Engel CM, **Stingele J** (2025). Cellular responses to RNA damage.
Cell 188:885-900. doi: 10.1016/j.cell.2025.01.005

Eustermann S, Patel AB, **Hopfner KP**, He Y, **Korber P** (2024). Energy-driven genome regulation by ATP-dependent chromatin remodellers.
Nat Rev Mol Cell Biol. 25(4):309-332. doi: 10.1038/s41580-023-00683-y.

3 Overview of Projects (ID)

ID	Title	Research area	Principal investigator, institute,	Duration
A01	Domino nucleosome remodeling complexes and histone H2A.V dynamics in transcription & repair	Biochemistry, Molecular Cell Biology	Becker, Peter B LMU, BMC	01.10.13-30.06.25
A02	Chromatin regulation at promoters and enhancers	Genetics, Systems Biology	Gaul, UIrike LMU, Gene Center	01.10.13-30.06.21
A03	Chromatin remodelers ALC1 and HELLs regulate PARP dynamics and DNA repair	Biochemistry, Molecular Cell Biology	Ladurner, Andreas LMU, BMC	01.10.13-30.06.25
A04	Genome-wide reconstitution of dynamics in nucleosome positioning, collision, eviction and histone exchange	Molecular Biology and Genetics	Korber, Philipp LMU, BMC	01.10.13-30.06.25
A05	Nucleosome dynamics and linker molecules in replication initiation	Molecular Cell Biology	Schepers, Aloys Helmholtz Großhadern	01.10.13-30.06.17
A06	Mechanisms of regulation and informa-tion processing by the INO80 remodeler	Structure Biology, Biochemistry	Hopfner, Karl-Peter LMU, Gene Center	01.10.13-30.06.25
A07	Nucleosome spacing in a folded chromatin environment	Biochemistry	Müller-Planitz, Felix, LMU, BMC	01.10.13-30.06.21
A08	RNAPII-CTD interactions with chromatin – crosstalk between the codes	Molecular Cell Biology	Eick, Dirk Helmholtz Großhadern	01.10.13-30.06.21
A09	Role of promoter-flanking nucleosomes in chromatin transcription	Structural biology, biochemistry, genomics	Cramer, Patrick LMU, Gene Center	01.10.13-30.06.17
A10	Functional characterization of novel mammalian histone variants	Molecular Cell Biology	Hake, Sandra LMU, BMC	01.10.13-30.06.17
A11	Silencing mechanisms of endogenous retroviruses	Molecular Cell Biology	Schotta, Gunnar LMU, BMC	01.10.13-30.06.25
A12	Histone H4K20 demethylation in cell cycle-controlled differentiation	Developmental Biology	Rupp, Ralph A.W. LMU, BMC	01.10.13-31.12.24
A13	Epstein-Barr virus DNA acquires cellular chromatin early in infection	Virology	Hammerschmidt, Wolfgang Helmholtz Großhadern	01.10.13-30.06.21
A14	Role of Signaling-to-chromatin pathways in mediating epigenetic plasticity	Developmental and cellular Biology	Classen, Ann-Kathrin LMU, Biozentrum	01.10.13-30.06.17
A15	Structural basis of nucleosome binding and chromatin compaction by PRC1	Dev. and Structural Biology, Biochemistry,	Müller, Jürg MPI Martinsried	01.10.13-30.06.25
A16	Metabolic coupling of histone modification during chromatin assembly	Mol. Cell Biology, Protein analytics	Imhof, Axel LMU, BMC	01.10.13-30.06.25
A17	Role and regulation of DNA modifications	Molecular Cell Biology. Biochemistry	Leonhardt, Heinrich LMU, Biozentrum	01.10.13-30.06.25
A19	Maintenance of chromatin organisation by Isw1a during transcription	Biochemistry, Molecular Cell Biology,	Smolle, Michaela LMU, BMC	01.07.17-30.06.21

A20	Control of gene expression through metabolic enzymes and their products	Biochemistry, Molecular Cell Biology	Schneider, Robert LMU, Helmholtz Neuherberg	01.07.17-30.06.25
A21	Nutritional reprogramming of chromatin interactions by glucocorticoid receptor	Molecular Cell Biology	Uhlenhaut, Henriette, TUM,	01.07.17-30.06.25
A22	Coordination and crosstalk of epigenetic pathways via non-catalytic functions of TET proteins	Molecular Cell Biology	Bultmann, Sebastian LMU, Biozentrum	01.07.17-31.12.22
A23	Chromatin as limiting factor in the regulation of DNA repair pathway choice	Molecular Cell Biology	Pfander, Boris MPI Biochemistry	01.07.17-30.06.21
A24	Molecular and biophysical determinants controlling heterochromatin formation and silencing in mouse embryo	Developmental and Cell Biology, Biochemistry	Torres-Padilla, Maria-Elena, LMU, Helmholtz Großhadern	01.07.17-30.06.25
A25	Role of the nuclear membrane protein Lem2 in retrotransposon silencing and RNA surveillance	Molecular Biology, Genetics	Braun, Sigurd LMU, BMC	01.07.17-30.06.21
A26	Establishment and role of chromatin structure around chromosome replication Origins	Biochemistry, Molecular Cell Biology	Kurat, Christoph LMU, BMC	01.07.18-30.06.25
A27	Cell cycle-dependent regulation of the ORC-associated protein LRWD1 by phosphorylation of an IDR	Molecular Cell Biology	Bartke, Till Helmholtz Neuherberg	01.07.21-30.06.25
A28	Characterization of the chromatin organization response to food deprivation in the intestine of *C. elegans*	Developmental and Molecular Cell Biology	Cabianca, Daphne Helmholtz Neuherberg	01.07.21-30.06.25
A29	Compositional and structural analysis of DNA replication origins by locus-specific chromatin isolation	Biochemistry	Hamperl, Stephan Helmholtz Großhadern	01.07.21-30.06.25
A30	Propagation of active chromatin states in embryos via histone modifications	Developmental Biology, Cell Biology	Hörmanseder, Eva Helmholtz Großhadern	01.07.21-30.06.25
A32	Protein and phosphorylation nuclear dynamics in time and space and its modulation by metabolism	Molecular Cell Biology, Biochemistry	Robles, Maria LMU, Med. Psychologie	01.07.21-30.06.25
A33	Role of chromatin in the establishment of inter-chromosomal interactions	Molecular Cell Biology	Siegel, Nicolai LMU, BMC	01.07.21-30.06.25
A34	Detection and repair of covalent DNA-histone crosslinks	Cell Biology, Biochemistry, Genetics	Stingele, Julian LMU, Gene Center	01.07.21-30.06.25
A35	Functional analysis and manipulation of chromatin dynamics on mammalian rDNA and Nucleolar Organizer Regions	Molecular Cell Biology	Stricker, Stefan LMU, BMC	01.07.21-30.06.25
IRTG	Integrated Research Training Group		Böke, Jörn LMU, BMC Korber, Philipp LMU, BMC	01.10.13-30.06.21 01.07.21-30.06.25
Z01	Administration and Coordination of Activities		Becker, Peter LMU, BMC	01.10.13-30.06.25

Z02	Monoclonal antibody core facilities	Immunology	Kremmer, Elisabeth Helmholtz Großhadern	01.10.13-30.06.17
Z03	Protein identification and Chromatin Proteomics	Protein Analytics	Imhof, Axel LMU, BMC	01.10.13-30.06.25
Z04	Bioinformatics Core Unit	Bioinformatics	Straub, Tobias LMU, BMC	01.10.13-30.06.25
Z05	Advance Light Microscopy	Molecular Cell Biology, Bioimaging	Neumann, Jürgen LMU, Biozentrum	01.10.13-30.06.17

4 Research Achievements of the CRC

4.1 Goals and development

We did not adopt the common practice in CRC applications to sort individual projects into separate thematic areas, as most projects integrate aspects of several mechanisms, processes and themes. Indeed, the excellent thematic coherence of the CRC consortium was a major strength.

In preparation for each new funding period, the investigators of the CRC held a workshop to define areas of research that seemed suited for collaboration. The overarching topics: ‘histone variants and modification’, ‘nucleosome remodeling’: ‘dynamics of stable structures’ were maintained throughout. For the second funding period we focused on processes that are subject to chromatin regulation: the transcription of genes, the replication of chromosomes and the maintenance of genome integrity. During the third funding period, two overarching transversal themes were introduced. One transversal theme involved ‘time lines’ in chromatin dynamics, where we consider mechanisms of reversible transitions (‘turnover’), irreversible emergence of stable states (‘trajectory’) and cyclical dynamics (‘cycle’). A second transversal theme considered various intersections between local chromatin organisation and cell metabolism.

During the course of the 12-year existence of the CRC, the field has moved much. We feel that the next level of investigation in our field may concern the interactions of the genome with the environment, in its broadest sense. Eukaryotic cells show an extraordinary capacity for adaptation in response to external cues, while maintaining stability and identity. An initiative for a new CRC has been launched, with a new team. They propose to study how chromatin influences cellular plasticity and resilience on a systems-level. There is an urgent need to bring together chromatin researchers with theoretical biologists skilled in single-cell biology and gene expression modeling, to bridge gaps between experiment and theory.

The CRC did not define scientific goals. Rather the goals involved (1) to support research of highest quality in the areas defined by our applications; (2) to support collaborative research;

(3) to support the careers of young group leaders and postdocs; (4) to provide exceptional training to the PhD candidates.

Concerning the quality of research, the reader is referred to the list of 50 selected publications (2.1), which testifies to the quality of our research output.

Concerning the collaborative research, we submit that among the 148 original publications published by CRC last-author investigators (excluding reviews and methods), 75 of them are collaborative, since investigators from 2 or more teams are among the authors. This is a spectacular rate of 50%. This number is an underestimate, since it does not include collaborations with Associated Members.

Because from the second funding period onwards there were more 'Chromatin' groups in Munich than could be accommodated in the proposal, we selected the 'Full Members' in a transparent procedure and included the remaining PIs in the network as 'Associated Members'. From its very beginning the CRC has cultivated this inclusive, embracing attitude towards colleagues, whose projects could not be accommodated in the proposal for one reason or another. Associated members were involved in all activities. Their PhD students were invited to join the IRTG, they were encouraged to invite and host seminar speakers, and they were permitted to apply for flexible funds in collaboration with a Full Member. This inclusive measure not only generated the vibrant research community in Munich, but it also provided a pool of potential participants for grant renewals. The associated teams strongly contributed to the evolution of CRC research in the form of transversal research themes. The following table lists the Associated Members, with the time periods of their membership and indicates if and when they were included in the CRC as Full Members.

Associated Members CRC 1064			
Name	**Affiliation**	**Period**	**Project leader**
Braun, Sigurd	LMU Physiol. Chem.	2013 - 2016	2017 – 2021
Solovei, Irina	LMU Biology	2014 - 2025	-
Pfander, Boris	MPI Biochemistry	2016	2017 – 2021
Schneider, Robert	Helmholtz Neuherberg	2016	2017 – 2025
Torres-Padilla, ME	Helmholtz Großhadern	2016	2017 – 2025
Bartke, Till	Helmholtz Neuherberg	2018 -2020	2021 – 2025
Stricker, Stefan	LMU Physiol. Genomik	2018 - 2020	2021 – 2025
Siegel, Nicolai	LMU Vet. Medicine	2018 - 2020	2021 – 2025
Stingele, Julian	LMU Gene Center	2019 - 2020	2021 – 2025
Bonev, Boyan	Helmholtz Großhadern	2020 - 2025	-
Hamperl, Stephan	Helmholtz Großhadern	2020	2021 – 2025
Hörmanseder, Eva	Helmholtz Großhadern	2020	2021 – 2025
Robles, Maria	LMU Med. Psychology	2020	2021 – 2025
Cabianca, Daphne	Helmholtz Neuherberg	2020	2021 – 2025

Colomé-Tatché, Maria	LMU Physiol. Chem.	2021 - 2025	-
Gompel, Nicolas	LMU Biology	2021 - 2023	-
Margulies, Carla	LMU Physiol. Chem.	2021 - 2025	-
Regnard, Catherine	LMU Molecular Biology	2021 - 2025	-
Smolle, Michaela	LMU Physiol. Chem.	2021 - 2023	2017 – 2021
Tachibana, Kikuë	MPI Biochemistry	2021 - 2025	-
Villaseñor, Rodrigo	LMU Molecular Biology	2021 - 2025	-
Jeyaprakash, A.	LMU Gene Center	2024 - 2025	-

Our efforts to support the careers of young researchers is detailed in section 6.2.

Our strategy towards improving the generation and handling of data according to the FAIR criteria is detailed in report Z04. In short, we initiated an 'Open Science' Program for all PhD students. All PhD students received multiple counselling into appropriate data generation, handling and storage. The precise measures were not coordinated by the CRC, but left to the corresponding institutes' regulations. The main measure is to publish the results in journals that adhere to high documentation standards. Not only do those journals insist to upload all relevant data to repositories, but they increasing also request the filing of primary data.

4.2 Scientific Events and Science Communication

4.2.1 Chromatin Dynamic Lecture Series

The CRC hosted 237 seminars with external speakers, including 66 speakers from within Germany, 104 from European Countries and 67 from overseas (mainly the US). This is almost 20 seminars per year = every other week excluding holidays. A complete listing can be found at https://www.sfb1064.med.uni-muenchen.de/events/seminars/index.html

4.2.2. Chromatin Days

A highlight of the academic year in Munich are the 'Chromatin Days', which were organised by the CRC in the last week before the summer holidays. Formally, this day serves as the reporting meeting, where students/postdocs from all teams (Full and Associated Members) present their results. In 2019, we celebrated our 10th Chromatin Day and during the Covid19 year 2020 we held a Virtual Chromatin Day. The quality of the talks compares well to that of an international symposium. The events were broadly advertised to the local chromatin community. During the last years about 180 participants registered. The Chromatin Days served as a means to foster collaboration and exchange of information and they created a sense of 'belonging' to the chromatin community. In 2025, the 16th and last Chromatin Day celebrated the successes of the CRC with invited alumni/alumnae and a satellite IRTG networking meeting.

4.2.3 International Symposia

The CRC organized three international Symposia in the years 2016, 2019 and 2024 with about 300 participants (see also table in 4.1.5).

4.2.4 Co-hosting of BMC Trailblazer Lectures

The BMC initiated a series of so-called Trailblazer Lectures, held by eminent scientists whose pioneering work opened new research perspectives. Trailblazer Lectures are organized in collaboration with partner programs. https://www.med.lmu.de/bmc/de/news/trailblazer/

The CRC co-hosted and organized 4 out of the 6 trailblazer lectures as follows:

07. December **2021**	Anthony Hyman (MPI Dresden): Biomolecular condensates and their implications for physiology and disease
11. October **2022**	Edith Heard (EMBL, Heidelberg): EMBL's new science program: "Molecules to Ecosystems"
13. October **2023**	Xiaowei Zhuang (Harvard University): Spatially resolved single-cell genomics and cell atlas of the brain
03. December 2024	Shelley Berger (University of Pennsylvania): Epigenetic and neuropeptide (re)programming of ant behavior

4.2.5 Scientific events and Symposia

In addition to the regular external seminars, the CRC hosted or co-hosted numerous scientific events during the years 2013-2025, as indicated in the following table (SFB PIs in bold).

24 July **2014** LMU Biocenter Martinsried, Germany	**Responsible Research** – for next generation researchers Keynotes: Brigitte Jockusch/German Research Ombudsman, Ulrich Dirnagl, Alfonso Martinez-Arias Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs Munich Program: https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2014/index.html
23 July **2015** LMU Biocenter Martinsried, Germany	**Cutting-Edge Technologies** – for next generation researchers Keynotes: Emmanuelle Charpentier, Ernst Bamberg, Moritz Helmstädter Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs Munich Program: https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2015/index.html
10-12 March **2016** LMU Biomedical Center (BMC) Martinsried, Germany	**4th Munich International Chromatin Symposium: Chromatin Dynamics** Speakers: David Allis, Asifa Akhtar, Robin Allshire, Geneviève Almouzni, Emily Bernstein, Gregory Bowman, Sylvia Erhardt, Anja Groth, Kristian Helin, Karolin Luger, Oliver Rando, Amos Tanay, Carl Wu Organizers: **P. Becker, C. Brieger, A. Classen, D. Eick, S. Hake, A. Imhof, P. Korber, A. Ladurner, H. Leonhardt, J. Müller, A. Schepers, E. Schroeder-Reiter** Program: https://www.sfb1064.med.uni-muenchen.de/chromatin_symposium_2016/program/index.html
20 July **2017** LMU BMC and-Biocenter Martinsried, Germany	**Responsible Research** – for next generation researchers Keynotes: Joachim Heberle/ German Research Ombudsman, Marcus Munafò, Debora Weber-Wulff Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs Munich https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2017/program/index.html
21-22 Nov **2017** EMBL Heidelberg, Germany	**From Chromatin to RNA – A Systems View on Molecular Mechanisms** (EMBL-DFG Women in Science Network Conference, co-sponsored by CRC 1064) Contributing CRC 1064 speaker: **Michaela Smolle** (A19)
22 February **2018** LMU BMC Martinsried, Germany	**Developmental Programming and Reprogramming** (ITN Chromat*in*3D and **CRC 1064**) A one-day workshop on cell-fate decisions in organismal development involving chromatin organization and epigenetic regulators Speakers: Wendy Bickmore, Shelby Blythe, Andrea Brand, Eileen Furlong, George Garinis, Nicola Iovino, **Jürg Müller**, Alvaro Rada-Iglesias, Wolf Reik, **Ralph Rupp** Organizer: **Peter Becker** Program: https://www.sfb1064.med.uni-muenchen.de/events/3dchromatin/schedule/index.html
12-13 Sept **2018** LMU BMC Martinsried, Germany	**Secrets of Chromatin:** A tribute symposium (BMC and CRC 1064) Speakers: Geneviève Almouzni, Carl Wu, Cedric Clapier, Francis Stewart, **Sandra Hake**, Patrick Varga-Weisz Organizers: Alexander Brehm, **Axel Imhof**, Gernot Längst Program: https://www.sfb1064.med.uni-muenchen.de/events/secrets/secrets-program-new.pdf
21 September **2018** LMU BMC Martinsried, Germany	**Cell-to-Cell Heterogeneity in Chromatin Structure** (ITN Cell2Cell and CRC 1064) Experts in chromatin research and single-cell methods discuss new approaches to deconvolute dynamics and heterogeneity in chromatin structure in various systems. Speakers: Basem Al-Sady, Richard Bartfai, Magda Bienko, Maria Colomé-Tatché, Jane Mellor, **Robert Schneider**, Angela Taddei Organizers: **Sigurd Braun** and **Nicolai Siegel**
9 November **2018**	**Regulation of Transcription: RNA Pol II and Myc**

LMU BMC Martinsried, Germany	In honor of **Dirk Eick**: A career dedicated to understanding gene expression Speakers: **Patrick Cramer**, Jean-Christophe Andrau, Matthias Geyer, Heiko Hermeking, Michael Hölzel, **Axel Imhof**, Shona Murphy, **Robert Schneider** Organizers: Matthias Geyer, Michael Hölzel, Astrid Lunkes, **Elizabeth Schroeder-Reite**r Program: https://www.sfb1064.med.uni-muenchen.de/events/pol2/pol2-program/index.html
11 April **2019** LMU BMC Martinsried, Germany	**Sustainable World** – global challenges for life scientists Keynotes: Bernhard Felbermeier, Wolfram Mauser, Harald Welzer, Simone Müller Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs Munich https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2019/program/index.html
10-12 Oct. **2019** LMU BMC Martinsried, Germany	**5th Munich International Chromatin Symposium: Chromatin Dynamics** Speakers: Richard A. Young, Wouter de Laat, Michela Di Virgilio, Anne Ferguson-Smith, Christian Häring, René Ketting, Edward Lemke, Lucas Pelkmans, Kathrin Plath, Paola Scaffidi, Marc Timmers Organizers: **A. Imhof, C. Brieger, S. Bultmann, P. Korber, F. Müller-Planitz, R. Schneider, E. Schroeder-Reiter, H. Uhlenhaut** Program: https://www.sfb1064.med.uni-muenchen.de/symposium_2019/program/index.html
25-26 March **2021** Zoom, Meet Anyway; Virtual lectures, seminar rooms, breakout rooms and online activities	**Responsible Research** – virtual event for next generation researchers Keynotes: Ulrich Dirnagl, Ernst-Ludwig Winnacker, Carsten Reinemann, Renate Schiiebe/German Research Ombudsman Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs Munich https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2021/program/index.html
29 Sept 2022 BMC Martinsried, Germany	**Sustainable World** – Global challenges for Life Scientists Keynotes: Christian Holler, Bruno Kern, Isolde von Bülow, Brendan Antony Rouse Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2022/program/index.html
14-16 June **2023** Max Planck Institute of Biochemistry Martinsried, Germany	**Paris-Munich Epigenetics Workshop & Symposium 2023** An exchange between the Paris and Munich epigenetic research communities Speakers: Geneviève Almouzni, **Till Bartke**, **Peter Becker**, Déborah Bourc'his, Thomas Carell, Maria Colomé-Tatché**,** Pierre-Antoine Defossez, Maxim Greenberg, **Heinrich Leonhardt**, Raphaël Margueron, Sophie Polo, Claire Rougeulle, Kikuë Tachibana, **Maria-Elena Torres-Padilla**, EMBO YIP Lecturer Edda Schulz Organizers: **Till Bartke**, Pierre-Antoine Defossez, **Heinrich Leonhardt**, Kikuë Tachibana Program: https://www.sfb1064.med.uni-muenchen.de/events/paris_munich_epigenetics_2023/symposium/index.html
25 July **2024** BMC Martinsried, Germany	**Responsible Research** – for next generation researchers Keynotes: Gerlind Wallon, Bodo Richter, Susanne Beck Organizers: **CRC-IRTG 1064**/Life Science Network of Graduate Programs Munich https://www.responsibleresearch.graduatecenter.uni-muenchen.de/event2024/program/index.html
25 Sept **2024** LMU BMC Martinsried, Germany	**Diversity, Identity & Fate at Biomedical Frontiers** Symposium on diversity in research and in the people who do the research Speakers: Kikuë Tachibana, Ali Ertürk, Ulrike Protzer Organized by the BMC Initiative for Diversity and Inclusion, **CRC 1064**, CRC 1054, TRR 359, TRR 274, TRR 332, Synergy Munich https://www.sfb1064.med.uni-muenchen.de/events/events/diversity_symposium-2024/index.html
9-11 Oct. **2024**	**6th Munich International Chromatin Symposium: Chromatin Dynamics**

LMU BMC Martinsried, Germany	Speakers: Anja Groth (EMBO Keynote), Beat Fierz, Petra Hajkova, Job Kind, Ana Pombo, Karsten Rippe, Evi Soutoglou, Nicolas Thomä, Eileen Furlong, EMBO YIP Lecturers Francesca Mattiroli and Marieke Oudelaar Organizers: **T. Bartke, P. Becker, C. Brieger, D. Cabianca, S. Haas, P. Korber, E. Schroeder-Reiter, N. Siegel, S. Stricker,** R. Villaseñor Program: https://www.sfb1064.med.uni-muenchen.de/symposium2024/program/index.html
9-11 April **2025** Université Paris Cité, Paris, France	**Paris-Munich Epigenetics Workshop & Symposium 2025** 2nd exchange between the Paris and Munich epigenetic research communities Speakers: Dario Lupiañez (EMBO YIP Lecturer), **Daphne Cabianca**, Germano Cecere, Angélique Deleris, Ines Drinnenberg, Sandra Duharcourt, **Eva Hörmanseder**, **Karl-Peter Hopfner**, Romain Koszul, Christian Mayer, Pablo Navarro, **Charo Robles**, Irina Solovei, Rodrigo Villaseñor, Jonathan Weitzman Organizers: Germano Cecere, Pierre-Antoine Defossez, Sandra Duharcourt, **Daphne Cabianca**, Rodrigo Villaseñor Program: https://www.sfb1064.med.uni-muenchen.de/events/paris_munich_2025/symposium/index.html

Figure 4.2.5.: "Responsible Research" (2014, 2021, 2024), "Cutting Edge Technologies" (2015) and "Sustainable World" (2019, 2022) were campus-wide events, co-organized by the CRC-IRTG 1064, for next-generation researchers addressing the topics of research integrity, emerging technologies and sustainability in science and society.

4.2.6 Scientific communication and public engagement

The CRC was engaged in manifold scientific communication measures and participated in public engagement on many levels, ranging from maintaining an updated website, co-organizing and/or co-sponsoring events, participating in lay lecture series, to initiating new formats for exchange and discussion on topics of public interest. For example, the CRC-IRTG 1064, with partners from the Gene Center, *Katholische Hochschulgemeinde (KHG)* and the *Evangelische Studierende Gemeinde* (ESG), initiated interdisciplinary events on current topics of debate, open to the LMU academic community as well as to the interested public (Table 4.2.6.B). Project leaders and doctoral researchers engaged willingly and regularly in public events and formats. In general, by advertising within our well-connected scientific community and with the LMU Press Office, these and other lay-lecture and outreach events have been extremely well-attended by diverse audiences.

Table 4.2.6 (A, B, C): Science Communication measures and public engagement by the CRC 1064 from 2013-2025

A. Videos, animations, interviews

Date	Format & Venue	Target Group	
01.04.2019	Video	Scientific community, potential colleagues	LMU Life Scientists on Campus Großhadern/Martinsried featuring project leaders Stefan **Stricker**, Julian **Stingele**, Sigurd **Braun**, Felix **Müller-Planitz**, Henriette **Uhlenhaut**, Nicolai **Siegel**
11.12.2023	Animations	Scientific community, in particular for teaching and visual presentation	Remodeller animations for educational purposes in **Eustermann**, Patel, **Hopfner**, Yuan, **Korber**: *Energy-driven genome regulation by ATP-dependent chromatin remodellers*. Nature Reviews Molecular Cell Biology. https://doi.org/10.1038/s41580-023-00683-y
17.04.2024	Interview	Scientific community	Reprogramming Stars #15: Colliding Cellular Reprogramming Paths An Interview with Stefan **Stricker** (A35). Cellular Reprogramming Vol 26 (2). https://doi.org/10.1089/cell.2024.29115.shs

B. Public lecture series, lay seminars, discussions, open house events

Date	Format & Venue	Target Group	
2013 - present	Lecture series MPI, "Campus Martinsried"	Lay public, local community	*Wissenschaft für Jedermann/Was Wissen schafft* https://campusmartinsried.de/vortragsreihe-wissenschaft-fuer-jedermann-forschung-am-campus-martinsriedgrosshadern/ CRC 1064 Contributors: 05 Nov 2013 Peter Becker (A1) & Jörn Böke (IRTG) 06 Mai 2014 Peter Becker (A1) 05 Mai 2015 Andreas Ladurner (A03) 05 Apr 2016 Axel Imhof (A16) 04 Jul 2017 Philipp Korber (A04) 05 Jun 2018 Tobias Straub (Z04) 06 Nov 2018 Michaela Smolle (A19) 06 Jul 2021 Peter Becker (A1) 05 Jul 2022 Nicolai Siegel (A33)
19.01.2018	Lectures and discussion* LMU Biocenter	Interdisciplinary academic community and interested public	Ethical Issues in Human Genome Editing: How far should we go? Speakers: Sebastian **Bultmann**(A22)/LMU Biology, Christof Breitsameter/LMU Theology
16.03.2019	Open House BMC	Lay public of all ages, local community	BMC Tag der offenen Tür Demonstrations/exhibits by BMC groups, lab and facility tours, "Kids Lab". Participation by CRC teams: A1 Becker, A3 Ladurner, A4 Korber, A7 Müller-Planitz, A11

			Schotta, A12 Rupp, A16 Imhof, A19 Smolle, A25 Braun, Z04 Straub.
17.12.2019	Lectures and discussion* LMU BioSysM	Interdisciplinary academic community and interested public	Organtransplantation und Xenotransplantation: Medizinische und ethische Diskussion mit Publikumsbeteiligung Speakers: Reiner Anselm/LMU Ethics, Helmut Arbogast/Surgeon LMU Klinikum, Heidemarie Hürten/Pastoral Care Klinikum Großhadern, Eckhard Wolf/Gene Center
20.01.2021	Lectures and discussion* Zoom Broadcast	Interdisciplinary academic community and interested public	Wie kommuniziert Wissenschaft? Diskussion mit Beispielen aus der aktuellen Coronavirus-Forschung an der LMU Speakers: Veit Hornung/Immunology, Oliver T. Keppler/Virology, Carsten Reinemann/Communication and Media research
17.05.2022	Lectures and discussion* Zoom Broadcast	Interdisciplinary academic community and interested public	Epigenetik: Erwächst aus einem erweiterten Blick innerhalb der Genetik eine neue Verantwortung? Speakers: Philipp **Korber** (A04)/Molecular Biology, Christian Kummer SJ/ Philosophy
16.03.2023	Open House BMC	Lay public of all ages, local community	BMC Tag der offenen Tür Demonstrations/exhibits by BMC groups, lab and facility tours, “Kids Lab”. Participation by CRC teams: A1 Becker, A3 Ladurner, A4 Korber, A7 Müller-Planitz, A11 Schotta, A12 Rupp, A16 Imhof, A26 Kurat, A33 Siegel, A35 Stricker, Z04 Straub.
23.11.2024	Panel discussion Deutsches Museum, Munich	Lay public	Stem Cells & Ethics Panel discussion at the Deutsches Museum (a Helmholtz Munich collaboration) with contributing PIs Stefan **Stricker**(A35) and Maria-Elena **Torres-Padilla** (A24)
07.11.2024	“Laien Lunch” BMC	Non-scientist BMC employees	*“Urzeugung“ und „Lebenskraft“ - Warum die Bäckerhefe am Anfang der biochemischen Forschung steht und auch heute noch aktuell ist* Speaker: Philipp **Korber** (A04)
04.04.2025	Panel discussion BMC	Doctoral researcher community	<interact 2025> Podium discussion “Science and Politics”, moderated by Peter **Becker** (A01) with keynote speakers Lukas Milles/Artificial Intelligence, Ranga Yogeshwar/Science Communication, John Glass/Synthetic Biology, Liang Liang/Personalized Medicine, Guangbo Chen/Translational Medicine https://www.munich-interact.de/
21.05.2025	“Laien Lunch” BMC	Non-scientist BMC employees	*Das menschliche Genom: Warum wir sind, wie wir sind* Speaker: Peter **Becker** (A01)

*Interdisciplinary seminars of current public interest and broader scientific scope and at the interface of life sciences and ethics, organized by the IRTG 1064 in collaboration with the Gene Center, LMU Katholische Hochschulgemeinde/KHG and Evangelische Studierende Gemeinde/ESG

C. Public engagement by doctoral researchers (IRTG 1064 members)

Date	Format & Venue	Target Group	
22.07.2020	Science pitch Zoom broad-cast	Lay public	Soapbox Science Munich* Soapbox speaker: IRTG 1064 member **Janet Tait** (AG **Rupp**) **"**Common threads: A journey through embryonic development with the strange-footed frog**".**
23.07.2022	Science pitch Odeons-platz, Munich	Lay public, passersby	Soapbox Science Munich* Soapbox speaker: IRTG 1064 member **Vanessa Luzak** (AG **Siegel**) "How parasites regulate their genes to trigger infections."
28.02.2024	YouTube channel videos	Lay public, young audience	"Sciencerely", a science communication YouTube channel anchored by IRTG 1064 member **Clemens Steinek** (AG **Leonhardt**) https://www.youtube.com/@Sciencerely
13.02.2025	Science slam Museum Mensch & Natur	Interested lay public, student audience	Center for Advanced Science/CAS Science Slam "Mystery of Reproduction" IRTG 1064 member **Jie Hua** (AG **Imhof**) participated with his slam: "Molecular Mechanisms of Hybrid Incompatibility in Drosophila"
20.03.2025	Podcast	Interested peers and general public	Daily Dose of Honest Science_ monthly podcast since 15.09.2023 by **Dr. Chandni Kumar** (AG **Imhof**) https://open.spotify.com/show/0CiSf91dGsvx6LX4NGGWmH Interview with Stefan Stricker (A35): "Gene Editing vs. Gene Reprogrammng: The Future of CRISPR & Medicine"

*Soapbox Science Munich is an initiative to increase visibility of current research by women in science. https://munichsoapboxscience.com/

4.3 National and international collaboration

Twenty-two years of DFG-funded chromatin research, first by TR5 and then by CRC1064 has created a local research community that constitutes an internationally renowned center of gravity for research on chromatin regulation and epigenetics. Once a critical mass of highly accomplished researchers had be created, a positive feedback loop led to more recruitments in the area. Today, the Munich chromatin research community consist of more than 30 principal investigators, who are well networked among themselves but also connected to the international research community.

A similar cluster of prominent chromatin groups is placed in Paris, France. The two sites applied jointly for funding from the French-German University for two consecutive workshops in the years 2023 and 2024 aimed at promoting the scientific interaction between the two research communities working on epigenetics in Paris and Munich. These two communities are

strong individually, but can work together even better by pooling knowledge and networking. The event was organized by a German-French consortium (Pierre-Antoine Defossez in Paris, and CRC members Heinrich Leonhardt, and Till Bartke).

The event consisted of two components: First, a workshop aimed at doctoral students and young postdoctoral researchers, with the goal of teaching them the conceptual basics of epigenetics, helping them build a network, and providing them with information and advice that will be useful for their careers in science. Twenty participants (ten from France and ten from Germany) were selected for this event from the applications received. The workshop participants automatically took part in the symposium. The workshop was followed by a scientific symposium in the classic format, which included presentations of varying lengths (keynote presentation for an invited guest speaker) and poster presentations. We awarded prizes for the two best presentations and the two best posters. Registration was free and open internationally. We had a total of 188 participants. The event was financed to about 80% by the UFA/DFH grant, while the remaining costs were covered by the University of Paris Cité and CRC1064.

In the following table the CRC investigators (RV, IS, KT and MCT are associated members) who either gave lectures or co-organized the meetings are listed in bold.

14-16 June **2023** Max Planck Institute of Biochemistry, Martinsried, Germany	**Paris-Munich Epigenetics Workshop & Symposium 2023** An exchange between the Paris and Munich epigenetic research communities Speakers: Geneviève Almouzni, **Till Bartke, Peter Becker,** Déborah Bourc'his, Thomas Carell, **Maria Colomé-Tatché**, Pierre-Antoine Defossez, Maxim Greenberg, **Heinrich Leonhardt**, Raphaël Margueron, Sophie Polo, Claire Rougeulle, **Kikuë Tachibana, Maria Elena Torres Padilla**, EMBO YIP Lecturer Edda Schulz Organizers: **Till Bartke**, Pierre-Antoine Defossez, **Heinrich Leonhardt, Kikuë Tachibana** Program: https://www.sfb1064.med.uni-muenchen.de/events/paris_munich_epigenetics_2023/symposium/index.html
9-11 April **2025** Université Paris Cité, Paris, France	**Paris-Munich Epigenetics Workshop & Symposium 2025** 2nd exchange between the Paris and Munich epigenetic research communities Speakers: Dario Lupiañez (EMBO YIP Lecturer), **Daphne Cabianca,** Germano Cecere, Angélique Deleris, Ines Drinnenberg, Sandra Duharcourt, **Eva Hörmanseder, Karl-Peter Hopfner**, Romain Koszul, Christian Mayer, Pablo Navarro, **Charo Robles, Irina Solovei, Rodrigo Villaseñor**, Jonathan Weitzman Organizers: Germano Cecere, Pierre-Antoine Defossez, Sandra Duharcourt, **Daphne Cabianca, Rodrigo Villaseñor** Program: https://www.sfb1064.med.uni-muenchen.de/events/paris_munich_2025/symposium/index.html

5. Impact on Research Priorities and International Visibility

Our efforts to strengthen the Munich Chromatin community through strategic recruitments led to a remarkable clustering of chromatin research in Munich, which is unmatched in Europe. Most CRC members have an international reputation and are often invited as speakers to international conferences or to serve on high-level advisory boards. Our international reputation is documented by two very strong activities: first, by the success of our regular seminar series, during which outstanding speakers follow our invitation to visit Munich, to present their latest research and to discuss with us. Secondly, our reputation is documented by our successful International Symposia on “Chromatin Dynamics” in each funding period (years 2016, 2019 and 2024), which have attracted about 300 registered participants from all over Europe (see 4.2.3).

The international reputation of the CRC investigators is further documented by the fact that they are often (s)elected to as Organisers of prominent international conferences. Examples from the long list of (co-)organizer functions of workshops and meetings are: Andreas Ladurner will chair the Gordon Research Conference (GRC) ‘Chromatin Structure and Function’ in the year 2026, Robert Schneider was Chair of the 2025 GRC ‘DNA and Histone Modifications’ and Axel Imhof will follow him in 2027. Maria Robles was Chair of the 2025 GRC on ‘Chronobiology’. Jürg Müller is Co-organizer of the EMBL Conference ‘Transcription and Chromatin’ in 2022 and 2024. Andreas Ladurner was an organizer of the Cold Spring Harbor meetings ‘The PARP Family and ADP-ribosylation’ in the years 2020, 2022 and 2024. Maria-Elena Torres-Padilla was the main organiser of the EMBO Nucleus conference in 2022.

The fact that the Munich chromatin community has filed a preproposal for a new CRC initiative termed ‘Chromatin as a mediator of nuclear plasticity and resilience’ is perhaps the most obvious testimony of the lasting impact of the CRC1064 on the local research structure and priorities.