## BIOGRAPHICAL SKETCH

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| NAME | POSITION TITLE |
|---|---|
| Joel C Eissenberg, Ph.D. | Professor of Biochemistry and Molecular Biology |
| eRA COMMONS USER NAME(credential, e.g., agency login)<br>eissenjc | |

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | YEAR(s) | FIELD OF STUDY |
|---|---|---|---|
| University of Tennessee, Knoxville, TN | B.A. | 1977 | Microbiology |
| University of North Carolina, Chapel Hill, NC | Ph.D. | 1982 | Genetics |
| Washington University, St. Louis, MO | Postdoctoral Fellow | 1982-87 | Molecular Biology |

### A. Personal Statement

My research, currently and previously funded by the NIH and NSF, has focused primarily on the regulation of gene transcription by chromatin and by RNA Poymerase II (Pol II) elongation factors. Work from my lab was critical in establishing that the evolutionarily conserved heterochromatin-associated protein HP1 is a dose-dependent modifier of gene silencing of euchromatic genes by heterochromatin. We also published the first work showing that an HP1 family protein is required for transcriptional activity of heterochromatic genes. More recently, my lab (in collaboration with the Shilatifard lab) has identified and characterized the Pol II elongation factors ELL and Elongin A in Drosophila. We have also demonstrated that Cdk9, the catalytic subunit of the Pol II elongation factor P-TEFb, is essential in Drosophila and is required in whole flies for phosphorylation of Pol II and for recruitment of ELL to chromatin. Since ELL is a translocation partner with MLL in certain pediatric leukemias, this work also has implications for a mechanistic understanding of carcinogenesis. Also in collaboration with the Shilatifard lab, we have characterized the roles of the histone demethylases UTX and LID in Drosophila. In collaboration with the Zempleni lab, we have established Drosophila as a model for understanding the role of histone biotinylation in gene expression and the control of retroelements. We propose to re-initiate our collaborative work on the Drosophila ELL elongation factor.

### B. Positions and Honors.

**Positions and Employment**

1982-1983 Postdoctoral Research Associate, Biology Dept, Washington University
1983-1986 NIH Postdoctoral Fellow, Biology Dept, Washington University
Jan-May 1987 Monsanto Fellow in Insect Biology, Biology Dept, Washington University
1987-1993 Assistant Professor of Biochem. & Molec.Biology, Saint Louis U. Medical School
1993-2003 Associate Professor of Biochem. & Molec. Biology, Saint Louis U. Medical School January-June 1996 Visiting Scientist, Biochem. & Molec. Biophys., Washington U. Medical School, (Sabbatical in the laboratory of Dr. P.M.J. Burgers)
2003-present Professor of Biochem. & Molec. Biology, Saint Louis U. Medical School
Professor of Pediatrics, Saint Louis U. Medical School

**Honors and Memberships in Advisory Committees**

NIH postdoctoral fellowship, 1983-86
Ad hoc member, NIH Fellowship study sections (BIOL 1, 1993; BIOL 2, 1997, 1999)
NSF grant panel "Biochemistry of Gene Expression", Spring 2003, Fall 2003, Spring 2004
NSF grant panel "Gene Expression I", Fall 2006, Fall 2007
NSF grant panel "Epigenetics", Fall 2009
Panel Member, Texas Advanced Research Program, 2006, 2008, 2010 (chair)
Chair, Presidents Research Fund review panel (Saint Louis University), Spring 2010, Fall 2010

### C. 15 selected publications relevant to this proposal (from a total of 74)

1. Gerber, M., J. Ma, K. Dean, J.C. Eissenberg†, and A. Shilatifard† (2001) Drosophila ELL is associated with actively elongating RNA polymerase II on transcriptionally active sites *in vivo*. EMBO J. 20: 6104-6114 (†co-corresponding authors) (PMID:11689450)
2. Eissenberg, J.C.†, J. Ma, M. A. Gerber, A. C. Christensen, J. A. Kennison, and A. Shilatifard† (2002) dELL, an essential RNA polymerase II elongation factor with a general role in development. Proc. Natl. Acad. Sci. USA 99:9894-9899 (†co-corresponding authors) (PMID:12096188)
3. Gerber, M., J.C. Eissenberg, S. Kong, K. Tenney, J. W. Conaway, R. C. Conaway and A. Shilatifard (2004) In vivo requirement of the RNA polymerase II elongation factor Elongin A for proper gene expression and development. Mol. Cell. Biol. 24: 9911-9919. (PMID:15509793)
4. Eissenberg, J.C., M. Wong and J.C. Chrivia (2005) Human SRCAP and *Drosophila melanogaster* DOM are homologs that function in the *Notch* signaling pathway. Mol. Cell. Biol. 25: 6559-6569. (PMID:16024792)
5. Gerber, M.A., A. Shilatifard and J.C. Eissenberg (2005) Mutational analysis of an RNA Polymerase II elongation factor in Drosophila melanogaster. Mol. Cell. Biol. 25: 7803-7811. (PMID:16107725)
6. *Eissenberg, J.C., and A. Shilatifard (2006) Leaving a mark: the many footprints of elongating RNA Polymerase. Curr. Op. Genet. Dev. 16: 184-190. (PMID:16503129)
7. Tenney, K., M. Gerber, A. Ilvarsonn, J. Schneider, M. Gause, D. Dorsett, J.C. Eissenberg and A. Shilatifard (2006) *Drosophila* Rtf1 functions in histone methylation, gene expression and *Notch* signaling. Proc. Natl. Acad. Sci. USA 103: 11970-11974. (PMID:16882721)
8. Camporeale, G., E. Giordano, R. Rendina, J. Zempleni†, and J.C. Eissenberg† (2006) Drosophila holocarboxylase synthetase is a chromosomal protein required for normal histone biotinylation, gene transcription patterns, lifespan and heat tolerance. J. Nutr. 136: 2735-2742. (†co-corresponding authors). (PMID:17056793)
9. Eissenberg, J.C., A. Shilatifard, N. Dorokhov and D.E. Michener (2007) Cdk9 is an essential kinase in Drosophila that is required for heat shock gene expression, histone methylation and elongation factor recruitment. Mol. Genet. Genomics. 277: 101-114. (PMID: 17001490)
10. Camporeale, G., J. Zempleni†, and J.C. Eissenberg† (2007) Susceptibility to heat stress and aberrant gene expression patterns in holocarboxylase synthetase-deficient *Drosophila melanogaster* are caused by decreased biotinylation of histones, not of carboxylases. J. Nutr., 137: 885-889. (†co-corresponding authors) (PMID:17374649)
11. Eissenberg, J.C., M.G. Lee, J. Schneider, A. Ilvarsonn, R. Sheikhattar and A. Shilatifard (2007) The trithorax-group gene in *Drosophila little imaginal discs* encodes a trimethylated histone H3 Lys4 demethylase. Nature Struct. Mol. Biol. 14: 344-346. (PMID:17351630)
12. Smith, E.R., M.G. Lee, B. Winter, N.M. Droz, J.C. Eissenberg, R. Shiekhattar and A. Shilatifard (2008) Drosophila UTX is a histone H3 Lys27 demethylase that co-localizes with the elongating form of RNA polymerase II. Mol. Cell. Biol. 28: 1040-1046. (PMID:18039863)
13. Smith, E.R., B. Winter, J.C. Eissenberg and A. Shilatifard (2008) Regulation of the transcriptional activity of the poised RNA Polymerase II by the elongation factor ELL. Proc. Natl. Acad. Sci. USA 105: 8575-8579. (PMID:18562276)
14. Chew, Y.C., J.T. West, S.J. Kratzer, A.M. Ilvarsonn, J.C. Eissenberg, B.J. Dave, D. Klinkebiel, J.K. Christman and J. Zempleni (2008) Biotinylation of histones represses transposable elements in human and mouse cells and cell lines and in Drosophila melanogaster. J. Nutr. 138: 2316-2322. (PMID:19022951)
15. Eissenberg, J.C., and A. Shilatifard (2010) Histone H3 lysine 4 (H4K4) methylation in development and differentiation. Dev. Biol. 339:240-249. (PMID:19703438)

**D. Recent Research Support.**

Agency: National Institutes of Health
Proposal 1R21DK082476 (PIs: Zempleni, J., Eissenberg, J.C., Chang, Y.-H.) Funding period: 07/20/09-6/30/11
Title: Novel histone biotinylation sites and relationships to other epigenetic marks
Major goals: Identification of novel histone biotinylation sites, sites of co-modification with biotinylation and genetic interactions between enzymes that catalyze histone biotinylation and methylation.