

CHEMICAL HERITAGE FOUNDATION

**DANIEL S. KESSLER**

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview  
Conducted by

William Van Benschoten

at

University of Pennsylvania  
Philadelphia, Pennsylvania

on

13, 16, and 17 June 2003

From the Original Collection of the University of California, Los Angeles



**Daniel S. Kessler**

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Daniel S. Kessler

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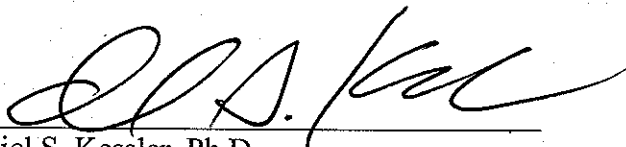
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## **DANIEL S. KESSLER**

1964 Born in Manhasset, New York, in February

### Education

1986 B.S., Biology, Cornell University  
1990 Ph.D., Molecular Biology, Rockefeller University

### Professional Experience

1986-1990 Rockefeller University, Laboratory of Molecular Cell Biology  
Doctoral research with Dr. James Darnell

1990-1991 New York University Medical Center, Department of Pathology  
Postdoctoral research with Dr. David Levy

1991-1995 Howard Hughes Medical Institute, Harvard University, Department of  
Molecular & Cellular Biology  
Postdoctoral research with Dr. Douglas Melton

1995-2002 University of Pennsylvania School of Medicine  
Assistant Professor, Department of Cell & Developmental Biology

2002-present University of Pennsylvania School of Medicine  
Associate Professor, Department of Cell & Developmental  
Biology

### Honors

1985-1986 Cornell Tradition Scholar  
1986 B.S., magna cum laude with distinction  
1986 Phi Kappa Phi Honorary Society  
1986-1987 ARCS Fellowship  
1990 Society of General Physiologists Scholarship, MBL Embryology Course  
1990 ARCS Scholar  
1991-1994 Jane Coffin Childs Memorial Fund Postdoctoral Fellowship  
1995-1998 University of Pennsylvania-HHMI Scientist Award  
1996-1999 American Digestive Health Foundation, AGA and Schering- Plough  
Corporation Research Scholar Award

1997-2001  
1999

Pew Scholars Program in the Biomedical Sciences Grant  
John Morgan Society

### Selected Publications

- Levy, D.E., Kessler, D.S., Pine, R., Reich, N.C. and J.E. Darnell, Jr. (1988). Interferon-induced nuclear factors that bind a shared promoter element correlate with positive and negative transcriptional control. *Genes and Development* 2: 3 83-393.
- Levy, D.E., Reich, N.C., Kessler, D.S., Pine, R. and J.E. Darnell, Jr. (1988). Transcriptional regulation of interferon-stimulated genes: a DNA response element and induced proteins that recognize it. *Cold Spring Harbor Symposium of Quantitative Biology* LIII: 799-802.
- Kessler, D.S., Pine, R., Pfeffer, L.M., Levy, D.E. and J.E. Darnell, Jr. (1988). Cells resistant to interferon are defective in activation of a promoter-binding factor. *EMBO Journal* 7: 3779-3783.
- Kessler, D.S., Levy, D.E. and J.E. Darnell, Jr. (1988). Two interferon-induced nuclear factors bind a single promoter element in interferon-stimulated genes. *Proceedings of the National Academy of Sciences USA* 85: 852 1-8525.
- Levy, D.E., Kessler, D.S., Pine, R. and J.E. Darnell, Jr. (1989). Cytoplasmic activation of ISGF3, the positive regulator of interferon- $\alpha$  stimulated transcription: reconstitution in vitro. *Genes and Development* 3: 1362-1371.
- Fu, X.-Y., Kessler, D.S., Veals, S.A., Levy, D.E. and J.E. Darnell, Jr. (1990). ISGF3, the transcriptional activator induced by IFN $\alpha$ , consists of multiple interacting polypeptide chains. *Proceedings of the National Academy of Sciences USA* 87: 8555-8559.
- Kessler, D.S., Veals, S.A., Fu, X.-Y. and D.E. Levy. (1990). IFN $\alpha$  regulates nuclear translocation and DNA-binding affinity of ISGF3, a multimeric transcriptional activator. *Genes and Development* 4: 1753-1765.
- Levy, D.E., Lew, D.J., Decker, T., Kessler, D.S. and J.E. Darnell, Jr. (1990). Synergistic interaction between interferon- $\alpha$  and interferon- $\gamma$  through induced synthesis of one subunit of the transcription factor ISGF3. *EMBO Journal* 9: 1105-1111.
- Pine, R., Decker, T., Kessler, D.S., Levy, D.E. and J.E. Darnell, Jr. (1990). Purification and cloning of Interferon-Stimulated-Gene Factor 2: ISGF2 (IRF1) can bind to the promoters of both interferon- $\beta$  and interferon-stimulated genes but is not a primary transcriptional activator of either. *Molecular and Cellular Biology* 10: 2448-2457.
- Zahler, S.A., Najimudin, N., Kessler, D.S. and M.A. Vandeyar. (1990).  $\gamma$ -Acetolactate synthesis by *Bacillus subtilis*. In "Biosynthesis of Branched Chain Amino Acids". Z. Barak, D. Chapman, and J. Schloss, eds. New York, VCH Publishers. pp. 25-32.
- Veals, S.A., Kessler, D.S., Josiah, S.M., Leonard, D.G.B. and D.E. Levy. (1991). Signal transduction pathway activating interferon- $\alpha$ -stimulated gene expression. *British Journal of Haematology* 79 suppl: 9-13.
- Kessler, D.S. and D.E. Levy. (1991). Protein kinase activity required for an early step in interferon- $\gamma$  signalling. *Journal of Biological Chemistry* 266: 2347 1-23476.
- Steinbeisser, H., De Robertis, E.M., Ku, M., Kessler, D.S. and D.A. Melton. (1993). *Xenopus* axis formation: induction of Goosecoid by injected Xwnt-8 and Activin mRNAs. *Development* 118: 499-507.

- Kessler, D.S. and D.A. Melton. (1994). Vertebrate embryonic induction: mesodermal and neural patterning. *Science* 266: 596-604.
- Huang, W., Kessler, D.S. and R.L. Erikson. (1995). Biochemical and biological analysis of Mek phosphorylation site mutants. *Molecular Biology of the Cell* 6: 237-254.
- Kessler, D.S. and D.A. Melton. (1995). Induction of dorsal mesoderm by soluble, processed Vg1 protein. *Development* 121: 2155-2164.
- Kessler, D. S. (1995). Regulation of cell fate by processed Vg1 protein. In "Organization of the Early Vertebrate Embryo". N. Zagris, A.M. Duprat, and A. Durston, eds. New York, Plenum Press. pp. 61-78.
- Henry, G.L., Brivanlou, I.H., Kessler, D.S., Hemmati-Brivanlou, A. and D.A. Melton. (1996). TGF3 signals and a pre-pattern in *Xenopus laevis* endodermal development. *Development* 122: 1007-1015.
- Goriely, A., Stella, M., Coffinier, C., Mailhos, C., Dessain, S., Kessler, D. and C. Desplan. (1996). A functional homologue of Goosecoid in *Drosophila*. *Development* 122: 1641-1652.
- Dohrmann, C.D., Kessler, D.S. and D.A. Melton. (1996). Induction of axial mesoderm by zDVR1, the Zebrafish orthologue of *Xenopus* Vg1. *Development Biology* 175: 108- 117.
- Kessler, D.S. (1997). Siamois is required for formation of Spemann's organizer. *Proceedings of the National Academy of Sciences USA* 94: 13017-13022.
- Shah, S.B., Skromne, I., Hume, C.R., Kessler, D.S., Lee, K.J., Stern, C.D. and J. Dodd. (1997). Misexpression of Chick Vg1 in the marginal zone induces primitive streak formation. *Development* 124: 5127-5138.
- Kessler, D. S. (1998). Maternal signaling pathways and the regulation of cell fate. In "Cell Lineage and Fate Determination". S.A. Moody, ed. San Diego, Academic Press. pp. 323-340.
- Yao, J. and D.S. Kessler. (1999). Mesoderm induction in *Xenopus*: oocyte expression system and animal cap assay. In "Methods in Molecular Biology, Vol. 137: Developmental Biology Protocols, Vol. III". R.S. Tuan, and C.W. Lo, eds. Totowa, Humana Press. pp. 169-178.
- Wall, N.A., Craig, E.J., Labosky, P.A. and D.S. Kessler. (2000). Mesendoderm induction and reversal of left-right pattern by mouse Gdf1, a Vg1-related gene. *Developmental Biology* 227: 495-509.
- Conlon, F.L. and D.S. Kessler. (2000). Hopping into the new millennium: eighth international *Xenopus* conference. *Trends in Genetics* 16: 537-540.
- Engleka, M.J. and D.S. Kessler. (2001). Siamois cooperates with TGf3 signals to induce the complete function of the Spemann-Mangold organizer. *International Journal of Developmental Biology* 45: 241-250.
- Yao, J. and D.S. Kessler. (2001). Goosecoid promotes head organizer activity by direct repression of Xwnt8 in Spemann's organizer. *Development* 128: 2975-2987.
- Engleka, M.J., Craig, E.J. and D.S. Kessler. (2001). VegT activation of *Sox 17* at the midblastula transition alters the response to Nodal signals in the vegetal endoderm domain. *Developmental Biology* 237: 159-172.
- Heasman, J., Wessely, O., Langland, R., Craig, E.J. and D.S. Kessler. (2001). Vegetal localization of maternal mRNAs is disrupted by VegT depletion. *Developmental Biology* 240: 377-386.

- Hanna, L.A., Foreman, R.K., Tarasenko, I.A., Kessler, D.S. and P.A. Labosky. (2002). Requirement for FoxD3 in maintaining pluripotent cells of the early mouse embryo. *Genes and Development* 16: 2650-2661.
- Yaklichkin, S., Steiner, A.B. and D.S. Kessler. (2003). Transcriptional Repression in Spemann's Organizer and the Formation of Dorsal Mesoderm. In "The Spemann Organizer". H. Grunz, ed. Heidelberg, Springer-Verlag Press. In press.
- Steiner, A.B., Lefebvre, J.L., Engleka, M.J., Walters, J., Yaklichkin, S., Craig, E.J., Labosky, P.A. and D.S. Kessler. (2003). FoxD3 is a Nodal-dependent regulator of *Xenopus* mesoderm formation that represses transcription in the Spemann organizer. In preparation.
- Bae, S. and D.S. Kessler. (2003). Direct activation of Goosecoid transcription by Siamois and Twin homo- and hetero-dimers. In preparation.
- Bae, S. and D.S. Kessler. (2003). Siamois and Twin are redundant genes required for the formation of Spemann's organizer. In preparation.
- Yao, J. and D.S. Kessler. (2003). Multiple Goosecoid binding sites mediate graded repression of Xwnt8 transcription. In preparation.
- Craig, E.J., Engleka, M.J., Blank, R. and D.S. Kessler. (2003). Restricted expression of a *Xenopus* I2-macroglobulin in the dorsal primitive gut. In preparation.

## ABSTRACT

**Daniel S. Kessler** was raised in Binghamton, New York, the youngest of three siblings. His mother was a public school teacher; his father taught at Binghamton University and was a published poet. Much of Kessler's life was spent within an academic world, with undergraduate and graduate student and faculty stopping by his family's home. The family also traveled when Kessler's father was on sabbatical, at one point providing Kessler with the opportunity to attend school in Hawaii, during which time he was exposed to the wonderment of science and, especially, marine biology. His time in public schools in Binghamton was typical, though being involved with the university allowed him access to outlets for his interest in music.

Kessler matriculated at Cornell University for his undergraduate degree; it was not until he worked in Stanley A. Zahler's bacterial genetics laboratory that he decided to become a scientist. He then went on to Rockefeller University in New York City, New York, for his graduate studies. At Rockefeller, Kessler worked with James Darnell on interferon signaling proteins (the STATs) identifying the activation of STATs in response to interferons, the STAT complex, and its regulation; during this time he also had the opportunity to learn structural biology at Oxford University in Anthony R. Rees's laboratory as part of a summer exchange program and to attend Ronald McKay's summer course in neurobiology at Cold Spring Harbor Laboratory. Following his Ph.D., Kessler decided to pursue postdoctoral research in developmental biology on the regulation of the mesoderm and endoderm germ layers by the transformation growth factor beta signaling molecule, Vgl, with Douglas A. Melton at Harvard University. He then accepted a faculty position at the University of Pennsylvania School of Medicine to work on the control of mesoderm and endoderm germ layer formation, the behavior of nodal signals during different stages of embryogenesis, and the formation of the Spemann organizer.

Throughout his oral history interview Kessler discusses issues like scientific funding; the grant-writing process; the role of the Pew Scholars Program in the Biomedical Sciences award for his work; balancing family and career; his future projects incorporating other model systems into his research strategies for studying endoderm germ layer differentiation and dorsal body axis formation; and the history of science and his research. The interview ends a discussion of what Kessler thinks about being a principal investigator, and concludes with more on his father's career.

## UCLA INTERVIEW HISTORY

### INTERVIEWER:

William Van Benschoten, Interviewer, UCLA Oral History Program. B.A., History, University of California, Riverside; M.A., History, University of California, Riverside; C. Phil., History, UCLA

### TIME AND SETTING OF INTERVIEW:

**Place:** Kessler's office, Cornell University.

**Dates, length of sessions:** June 13, 2003; June 16, 2003; and June 17, 2003.

**Total number of recorded hours:** 6.0

**Persons present during interview:** Kessler and Van Benschoten.

### CONDUCT OF INTERVIEW:

This interview is one in a series with Pew Scholars in the Biomedical Sciences conducted by the UCLA Oral History Program in conjunction with the Pew Charitable Trusts' Pew Scholars in the Biomedical Sciences Oral History and Archives Project. The project has been designed to document the backgrounds, education, and research of biomedical scientists awarded four-year Pew scholarships since 1988.

To provide an overall framework for project interviews, the director of the UCLA Oral History Program and three UCLA faculty project consultants developed a topic outline. In preparing for this interview, Van Benschoten held a telephone preinterview conversation with Kessler to obtain written background information (curriculum vitae, copies of published articles, etc.) and agree on an interviewing schedule. He also reviewed prior Pew Scholars' interviews and the documentation in Kessler's file at the Pew Scholars Program office in San Francisco, including Kessler's proposal application, letters of recommendation, and reviews by Pew Scholars Program national advisory committee members.

### ORIGINAL EDITING:

Carol Squires edited the interview. She checked the verbatim transcript of the interview against the original tape recordings, edited for punctuation, paragraphing, and spelling, and verified proper names. Words and phrases inserted by the editor have been bracketed.

Kessler reviewed the transcript. He verified proper names and made minor corrections and additions.

Squires prepared the table of contents. Van Benschoten assembled the interview history. TechniType assembled the guide to proper names.

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