
SUSAN MAHLER ZNEIMER, PH.D., FACMG G

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CURRICULUM VITAE

PRESENT PROFESSIONAL ACTIVITIES

SYMBIOTICA, VACAVILLE, CA

2019 – PRESENT

CEO AND LABORATORY DIRECTOR

CEO and Laboratory Director of a start-up high-tech company providing laboratory testing for significant population-based tests including pharmacogenomics, autoimmune disorders, allergies, infectious diseases, hematology, chemistry and gut microbiome disorders.

MOSYS (MEDICAL, OPERATIONS, SYSTEMS) CONSULTING, VANCOUVER, WA

2007 – PRESENT

CEO AND SCIENTIFIC DIRECTOR

Clinical Genetics Laboratory Director offering consulting services to laboratories for clinical case review in molecular genetics and cytogenetics, laboratory expertise for quality improvement and cost reduction through Six Sigma. Offer expertise to consulting firms and companies on information and medical writing regarding genetics, molecular biology, laboratory services and related fields. Current clients include City of Hope Medical Center, UCLA, Allina Health. Past clients included Integrated Oncology (a LabCorp company), Genzyme Genetics, UCSF, Signature Genomics, University of Utah/ARUP Laboratories, Epic Sciences, Epinomics, Kaiser Permanente, Virtual Scientific, CombiMatrix, Natera, Sterling Pathology, uBiome, MyOme and Ascend Genomics (formerly PathCentral).

PAST PROFESSIONAL EXPERIENCE

MOORPARK COMMUNITY COLLEGE, MOORPARK, CA

2008 - 2018

ADJUNCT ASSISTANT PROFESSOR, DEPARTMENT OF BIOLOGY

Teaching undergraduate Biology 2A lecture and laboratory course.

INTEGRATED ONCOLOGY (A LABCORP COMPANY) IRVINE/CALABASAS, CA

2009 – 2013

DIRECTOR, CYTOGENETICS LABORATORY

Director (part-time) of the cytogenetics laboratory, performing cytogenetic and FISH analysis on cancer specimens for the diagnosis and prognosis of leukemias, lymphomas and solid tumors.

UNIVERSITY OF SOUTHERN CALIFORNIA KECK SCHOOL OF MEDICINE LOS ANGELES, CA

2003 – 2013

ADJUNCT CLINICAL ASSISTANT PROFESSOR OF PATHOLOGY

Responsible for the supervision and training of the Pathology Residents and Fellows of the USC School of Medicine in clinical cytogenetics.

QUEST DIAGNOSTICS (FORMERLY SMITHKLINE BEECHAM) WEST HILLS, CA

1998 – 2007

DIRECTOR AND CHIEF OF THE CYTOGENETICS LABORATORY

Director of a staff of over 75 people, including 3 Ph.D. cytogeneticists, and over 70 cytogenetic technologists, technicians and support staff, of a full service laboratory performing prenatal, solid tissue and tumor, blood, and bone marrow specimens comprising over 25,000 specimens per year. The laboratory utilized fluorescence in situ hybridization (FISH) for diagnosis of specific genetic disorders (microdeletion disorders, cancers), and chromosomal identification. The laboratory also included biochemical genetics testing for amniotic fluid alpha-fetoprotein, acetylcholinesterase and fetal hemoglobin testing.

- ❑ Established Cytogenetics Technology Training Program
- ❑ Initiated Pathology Residency Training Program with USC and Loma Linda Medical Schools.
- ❑ As a Six Sigma certified Green Belt, utilized lean, 5-S and DMAIIC processes to improve laboratory practices.

KAISER PERMANENTE MEDICAL CENTER SAN JOSE & OAKLAND, CA

1993 – 1998

DIRECTOR, NORTHERN CALIFORNIA REGIONAL CYTOGENETICS LABORATORY

GENETRIX, INC. ALAMEDA, CA

1991 – 1993

DIRECTOR, CYTOGENETICS LABORATORY

CERTIFICATION AND LICENSURE

- Board Certification in Clinical Cytogenetics, American Board of Medical Genetics, Since June 1993.
Laboratory Director Certification in Molecular and Cytogenetics, Oncology, New York State, Since 1998.
Laboratory Director Licensure in Cytogenetics, California State, Since 2002, Lic. # DRM 024.
Certification, Six Sigma Green Belt, Quest Diagnostics, September 2006.

PROFESSIONAL AFFILIATIONS

- Diplomat, American Board of Medical Genetics
- Fellow, American College of Medical Genetics
- American Association for the Advancement of Science
- American Society of Human Genetics
- Association for Molecular Pathology
- American Cytogenetics Conference
- Cancer Cytogenomics Microarray Consortium
- Inter. Standards for Cytogenomic Array Consortium

PROFESSIONAL COMMITTEES AND BOARD MEMBERSHIPS

Reviewer - American Journal of Medical Genetics	2012-present
Reviewer - Cancer Genetics	2014-present
Laboratory Inspector, College of American Pathologists	2000-present
Exam writer for the American College of Medical Genetics	2004 - 2013
Program Chair, American Cytogenetics Conference (2006-2010)	2006 & 2010
Participant, Women's Unlimited program for leadership training	2001 & 2002
Member, Children's Cancer Group Reference Laboratories	1994 & 2002
Chair, Cytogenetics Section, Annual Kaiser Interregional Genetics Meeting (1995, 1997)	1994 & 1998
Private Industry Council Board Member, Alameda County, CA	1992 & 1994
Member and Lecturer, National Tay-Sachs Foundation, North Texas Chapter	1989 & 1991

HONORS

- Cambridge Who's Who's VIP award for Recognition of Leadership in the Biology Field, 2010
Leadership Award, Women's Unlimited, 2002
Postdoctoral Presentation Award, Texas Genetics Society Meeting, 1990.
Gamma Sigma Delta, National Honor Society of Agriculture, 1988.
Hillel Foundation Graduate Student Achievement Award, Texas A & M University, 1987.

EDUCATION

Postdoctoral Fellow: University of Texas Southwestern Medical Center, Department of Pathology, 1989-1991.
Field of Study: Clinical Cytogenetics

Doctorate: Texas A & M University, College of Veterinary Medicine, 1989. Field of Study: Genetics
Dissertation Title: Comparative Regional Localization of the Fibronectin and Gamma Crystallin Genes in the Mouse and Cow, and Karyotypic Analysis of Bovine-Hamster Hybrid Somatic Cells for Use in Cattle Gene Mapping.

Master of Arts: University of California at Los Angeles, College of Letters and Science, 1986.

Major: Biochemical Genetics.

Thesis Title: Intraspecific Genetic Variation and Systematics of *Agosia chrysogaster* (Cipriniformes: Cyprinidae).

Graduate Study: Hebrew University, Jerusalem, Israel, 1981. Non-matriculate study in genetics.

Bachelor of Arts: University of California at San Diego, Revelle College, 1980. Major: Zoological Biology.

TEACHING EXPERIENCE

- Director and Lecturer, Molecular Genetics Scientist Training Program, Natera, Inc, May 2015-2018.
- Instructor, General Biology for majors-with laboratory, Moorpark College, 2008-2018.
- Instructor for Continuing Education at US Labs, 2009-2013; teaching genetics, cancer genetics and case conferences for pathologists and laboratory staff.
- Director, Cytogenetics Technology Training Program, Quest Diagnostics, 1998-2007; one year program with course-work and on-site training for NCA technology certification in clinical cytogenetics.
- Instruction of Pathology Residents and Fellows from USC Keck School of Medicine and Loma Linda Medical School, in Cytogenetics, 2002-2007.
- Instruction and supervision of Genetic Counselor Graduate Students from California State University at Northridge, for rotation in Cytogenetics, 2000-2002.
- Instruction and supervision of Residents, Kaiser Permanente, 1993-1998; including pediatric, obstetric and pathology departments residency rotations in Cytogenetics Laboratory.
- Cytogenetic Technology Training Program, Genetrix, 1991-1993; course work and on-site training for NCA certification.
- Genetics, Department of Biochemistry, Texas A & M University, 1986-87; upper-level undergraduate genetics.
- General Biology Laboratory, Department of Biology, University of California at Los Angeles, 1985; biology.
- Cytogenetic Laboratory Techniques, Department of Biology, California State University at Dominguez Hills, 1983; undergraduate/graduate course for certification as a cytogenetic technologist.
- Department of Public Health, University of California at Los Angeles, 1982; Human cytogenetics graduate course for genetic counselor students.

INVITED LECTURESHIPS - CANCER GENETICS

- University of Texas San Antonio, Dec 2012: Mantle Cell Lymphoma
- Arizona Cytology Association, May 2012: The Cancer Genome, Implications for Leukemias and Lymphomas
- University of Texas San Antonio, May 2011: Microarrays in Cancer
- University of Texas San Antonio, May 2010: Cytogenetic and FISH Abnormalities in Lymphoid Malignancies
- University of Texas San Antonio, December 2009: Human Cancer Genome Project
- STS Sisterhood and Mens Club, October 2009: Stem Cell Research and Cancer
- Brandeis Menø Group Lecture Series, December 2008; Title: Stem cell research and cancer.
- Memorial Sloan Kettering-Cancer Center, September 2005; Faculty member of workshop entitled: FISH in Cancer.
- California State CLS Inland Empire Chapter, October 2004; Title: New Laboratory Insights into Hematologic Malignancy: CML and Mantle Cell Lymphoma.
- Northern Region Medical Technologist Symposium, Emeryville, CA. and Santa Clara, CA., February, 1995. Title: Update in Hematological Malignancies-Cytogenetic Analysis.

INVITED LECTURESHIPS - GENETICS AND THE JEWISH PEOPLE

- Shomrei Torah Synagogue, November 26, 2018; Title: Genetic Disorders of the Jewish People.

- Hadassah - Thousand Oaks Chapter, October 2015; Title: Predisposition to Jewish Genetic Disorders.
- Shomrei Torah Synagogue, March 2015; Title: The Ashenazic Jewish Panel: What's In Your Genes?
- Etz Chaim Temple, March 2015; Title: The Ashenazic Jewish Panel: What's In Your Genes?
- Women's League, Southwest Conference, March 2014; Title: The Ashenazic Jewish Panel, Who Should Be Tested?
- STS Rambam Community Lecture, October 2007; Title: Genetics and the Jewish People: a DNA Chain of Tradition.
- STS Sisterhood Community Lecture, February 2006; Title: Genetics and the Jewish People: a DNA Chain of Tradition.

I N V I T E D L E C T U R E S H I P S - T H E H U M A N G E N O M E P R O J E C T

- Martin Luther King-Drew Medical Center ó Los Angeles, CA, January 2003.
- Clinical Laboratory Scientists of Chantilly ó Chantilly, Pennsylvania, June 2002.
- California Laboratory Scientists of Alaska Annual Meeting ó Alieska, Alaska, April 2002.
- Clinical Leadership and Management Association Annual Meeting, Saint Louis, MO, June 2001.
- California State University at Northridge, November 2000.
- Victorville Community Hospital - Victorville, CA, July 2000.
- California Laboratory Scientists of Riverside - Riverside, CA, April 2000.

I N V I T E D L E C T U R E S H I P S - G E N E R A L T O P I C S

- Kaiser Permanente, June 2019; Title: KISS - Keep it Smart and Simple: Improving Laboratory Efficiency and Effectiveness.
- Moorpark College, May 2000; Title: The Genetics Laboratory Workplace-SCANS Competency, for the College Success Strategies course.
- Univ. of California at San Francisco, 1995-1998; graduate genetic counseling students - topics include cancer cytogenetics.
- Calif. Association. for Medical Laboratory Technology Annual Meeting, Santa Clara, CA, October 1997; Title: Ethical Issues in Genetics.
- Calif Society for Clinical Lab Science Annual Meeting, Oakland, CA, April 1997; Title: Genetics Testing and Ethics.
- California State University at San Jose Faculty Seminar, November 1996; Title: Evolutionary Genetics.
- Foothill Community College, July 1996; Genetics lecture for an introductory biology course.

P L A T F O R M A N D P O S T E R P R E S E N T A T I O N S

- 2019 Validation of SNP-Based Noninvasive Prenatal Screening Test to Detect Maternal X Chromosome Abnormalities.
- Poster presentation at the 23rd International Conference on Prenatal Diagnosis and Therapy.
- 2016 Report of two cases of elderly patients with refractory chronic lymphocytic leukemia and myelodysplasia with ring sideroblasts, del(20q), and SF3B1 mutation.
- Poster presentation at the American Society of Clinical Pathology annual conference.
- 2016 Non-Invasive Prenatal Screening of Over 500,000 Tests Performed at Natera
- Platform presentation at the American Cytogenetic Conference.
- 2011 Increased FISH abnormality detection rate using plasma cell enriched cell sorting for plasma cell disorders.
- Poster presentation at the International Congress of Human Genetics Meeting, Montreal, Canada.
- 2009 The Human Cancer Genome Project
- Platform presentation at the CLMA ThinkLab Conference.
- 2008 Laboratory quality improvement and financial success through six sigma methodology.
- Platform presentation at the American Cytogenetics Conference.
- 2001 Complex chromosome rearrangements: a new mechanism in cell division.
- Poster presentation at the International Congress of Human Genetics, Vienna, Austria.

- Poster presentation at the American Society of Human genetics annual meeting.
- 2000 Complex chromosome rearrangement involving two cytogenetic abnormalities in chromosome 5.
 - Platform presentation at the American Cytogenetics Conference.
- 2000 Abnormal phenotype including mental retardation associated with an apparently balanced interchromosomal insertion (X;8)(p22.1;p23.1p23.3) in a female.
 - Poster presentation at the Association of Genetics Technologists Annual Meeting.
- 1999 Telomere-telomere fusion of chromosome 7 and 22 with an interstitial deletion of chromosome 7p11.2-p15.1: phenotypic consequences and possible mechanisms.
 - Poster presentation at the American Society of Human Genetics Annual Meeting.
- 1999 Double recombinant chromosome 22~~q~~ in a family with an inherited pericentric inversion through 3 generations.
 - Poster presentation at the American Society of Human genetics annual Meeting (with J. Kelly, presenter).
- 1998 BCR/ABL Gene Rearrangement Present on Chromosome 9 in a Case of a Philadelphia Positive Acute Myeloid Leukemia.
 - Platform presentation at the FISH-New Technologies and Clinical Applications Annual Meeting.
- 1998 Familial Deletion of 5p15.2 in a Child with Cri du Chat Syndrome.
 - Platform presentation at the Interregional Kaiser Genetics Annual Conference.
- 1996 Mosaicism for Multiple Structural Abnormalities in Chorionic Villus Samples Confirmed in the Fetus.
 - Platform presentation at the American Society of Human Genetics Annual Meeting.
- 1995 Partial Trisomy of chromosome 6q, an Interstitial Duplication of the Long Arm.
 - Platform presentation at the Interregional Kaiser Genetics Annual Conference.
 - Poster presentation at the Association of Cytogenetic Technologists Annual Meeting.
 - Poster presentation at the American Society of Human Genetics Annual Meeting.
- Bi-phenotypic Leukemia Case Showing Both Acute Lymphoid and Myeloid Karyotypic Changes.
 - Platform presentation at the Interregional Kaiser Genetics Annual Conference.
 - Poster presentation at the Association of Cytogenetic Technologists Annual Meeting.
- 1994 Velocardiofacial and DiGeorge Syndromes: Differential Diagnosis Using FISH Analysis.
 - Poster Presentation at Association of Cytogenetic Technologists Annual Meeting.
 - Poster Presentation at the Interregional Kaiser Genetics Annual Conference.
 - Poster Presentation at the AAAS-Pacific Division Meeting.
- Utilization of FISH Analysis For Identification of a Chromosome Marker and Correlation With Phenotypic Characteristics.
 - Poster Presentation at the Association of Cytogenetic Technologists Annual Meeting.
 - Poster presentation at the AAAS-Pacific Division Meeting.
- Association of Confined Placental Mosaicism with Intrauterine Growth Restriction.
 - Poster presentation at the Society of Perinatal Obstetricians Annual Meeting.
- Molecular Genetic Analysis: Confined Placental Trisomy 2 Associated with Severe Intrauterine and Postnatal Growth Deficiency.
 - Poster presentation at the American Society of Human Genetics Annual Meeting.
- 1991 Chromosome Analysis of Human Epithelial Cells Transformed by Ionizing Radiation in vitro.
 - Poster presentation at the Association of Cellular Biology Annual Meeting.
- 1990 In Situ Hybridization Shows Direct Evidence of Uneven X Inactivation in Monozygotic Twin Females Discordant for Duchenne Muscular Dystrophy.
 - Platform presentation at the Texas Genetics Society Annual Meeting (Postdoctoral Presentation Award).
 - Platform presentation at the American Society of Human Genetics Meeting (Postdoc Clin Research Award Finalist).
- 1989 Regional Localization of Fibronectin & Gamma Crystallin Genes to Bovine Chrom. 8.
 - Platform presentation at the Texas Genetics Society Annual Meeting.
- 1988 Regional Localization of the fibronectin & Gamma Crystallin Genes to Mouse Chromosome 1 by In Situ Hybridization.
 - Platform presentation at the Texas Genetics Society Annual Meeting.
- 1986 Intraspecific Genetic Variation and Systematics of *Agosia chrysogaster*, a Cyprinid Fish.
 - Platform presentation at the American Society of Ichthyologists and Herpetologists.

1978 Comparative Chromosomal Banding Patterns of Two Langur Monkey Species.
- Platform presentation at the San Diego Zoo Research Symposium.

SCIENTIFIC JOURNAL PUBLICATIONS

- Vera-Wolff, P, Zneimer, S., et al., Measures of reproducibility in sampling and laboratory processing methods in a high-throughput sequencing microbiome clinical test (submitted).
- DiNonno, W, Zneimer, S, et al., Quality assurance of non-invasive prenatal screening (NIPS) for fetal aneuploidy using positive predictive values as outcome measures (submitted).
- Zneimer, S. M. (2020). Validation of fluorescence in situ hybridization (FISH) for chromosome 5 monosomy and deletion. *Current Protocols in Human Genetics*, e96. doi: 10.1002/cphg.96.
- Bik, E, Zneimer, S. et. al., (2019) A novel sequencing-based vaginal health assay combining self-sampling, HPV detection and genotyping, STI detection, and vaginal microbiome analysis. *PLOS ONE* PONE-D-18-10359R2. May 2019.
- Gupta S, Zneimer S, et al. (2018) Self-sampling for HPV testing: Increased cervical cancer screening participation and incorporation in international screening programs. *Front. Public Health* doi: 10.3389/fpubh.2018.00077. March 2018.
- Samango-Sprouse, C., Zneimer, S.M., et al., (2016) Incidence of X and Y Chromosomal Aneuploidy in a Large Child Bearing Population. *PLOS ONE* DOI:10.1371/journal.pone. 0161045 August 11, 2016.
- Liu, S.V., Zneimer, S., Tahbaz A, Douer D. (2011) Therapy Related AML Following Treatment with Trabectedin for Ewing's Sarcoma. *Acta Hematologica*, 126:76-78.
- Cutter, D., & Zneimer, S. M. (2009) Early Acquisition of American Sign Language: An Innovative Approach for Treating Attention-Deficit/Hyperactivity Disorder. *Sign Language Journal*, 1(1), Retrieved January 8, 2009, from Liferprint: <http://liferprint.com/signlanguagejournal/content/2009-01.htm>.
- Zneimer, S.M. (2002) The Human Genome Project: Exploring its progress and successes and the ethical, legal, and social implication. *Clin Leadership and Management Review* 16:151-161.
- Zneimer, S.M., P. Cotter, S.D. Stewart (2000) Telomere-telomere fusion of chromosomes 7 and 22 with an interstitial deletion of chromosome 7p11.2-p15.1: phenotypic consequences and possible mechanisms. *Clin Genet* 58:129-133.
- Zneimer, S.M., B. Zeil, R. Bachman (1998) Partial Trisomy of chromosome 6q, an interstitial duplication of the long arm. *AJMG* 80:133-135.
- Zneimer, S.M., J.B. Ravnan, L.S. Jenkins (1997) Assessment of cytogenetic results of 1339 cancer bone marrow chromosome studies. *AJHG* 61:A2144.
- Zneimer, S.M. and J.B. Ravnan (1996) Fluorescent in situ hybridization-FISHing for answers. *The Screen, Kaiser Permanente Genetics/Perinatal Newsletter* vol. 2, issue 7.
- Ravnan, J.B, LS. Jenkins and S.M. Zneimer (1996) Mosaicism for multiple structural abnormalities in chorionic villus samples confirmed in the fetus. *AJHG* 59:A130.
- Cowles, T.A., S.M. Zneimer and F.B. Elder (1996) A prospective cytogenetic study in third trimester placentas of fetuses with unexplained intrauterine growth restriction. *J. Maternal-Fetal Investigation* 6:207-209.
- Zneimer, S.M., N.R. Schneider and C.S. Richards (1993) In situ hybridization shows direct evidence of skewed X inactivation in one of monozygotic twin females manifesting Duchenne muscular dystrophy. *AJMG* 45:601-605.
- Zneimer, S.M., K.S. Lau, R.L. Eddy, T.B. Shows, D.T. Chuang and R.P. Cox (1991) Regional Assignment of two genes of the human branched-chain a-keto acid dehydrogenase complex: the E1B gene (BCKDHB) to chromosome 6p21-22 and the E2 gene (DBT) to 1p31. *Genomics* 10:740-747.
- Wilson, G.N., J.P. Stout, N.R. Schneider, S.M. Zneimer, and L.C. Gilstrap (1991) Balanced translocation 12/13 and situs abnormalities: homology of early pattern formation in man and lower organisms? *Am J Med Genet* 38:601-607.
- Fleishman, R.A., D.L. Saltman, V. Stastney and S. Zneimer (1991) Deletion of the c-kit proto-oncogene in the human developmental defect piebald trait. *PNAS* 23:10885.
- Zneimer, S.M., D. Crawford, N.R. Schneider and B. Beutler (1990) Mapping of the human ribonuclease inhibitor gene (RNH)

to chromosome 11p15 by in situ hybridization. *Genomics* 8:175-178.

- Zneimer, S.M. and J.E. Womack (1989) Regional localization of the fibronectin and gamma crystallin genes to bovine chromosome 8. *Genomics* 5:215-220.
- Womack, J.E., D.W. Threadgill, Y.D. Moll, L.K. Faber, M.L. Foreman, A.B. Dietz, T.C. Dobin, L.C. Skow, S.M. Zneimer, D.S. Gallagher and D.S. Rogers (1989) Syntenic mapping of 37 loci in cattle. *Cytogenet Cell Genet*.
- Zneimer, S.M. and J.E. Womack (1988) Regional localization of the fibronectin and gamma crystallin genes to mouse chromosome 1 by in situ hybridization. *Cytogenet Cell Genet* 48:238-241.
- Zneimer, S.M., A.T. Kumamoto and K. Benirschke (1979) Banding patterns of the chromosomes of two langur species, *Pygathrix nemeus* and *Presbytis entellus*; a comparative study. *Chrom Info Serv* 26:19-22.

M E D I C A L W R I T I N G P U B L I C A T I O N S

- *Hot Topics In Medicine, Genetics and Biology 2020*, Susan M. Zneimer, KD Publishers, December 2019.
ISBN: 978-1-71182502-1.
- *Cytogenetic Laboratory Management: Chromosomal, FISH and Microarray-Based Best Practices and Procedures*, Susan M. Zneimer, Wiley-Blackwell Publishers, Hoboken, NJ, USA, 2016.
- *Cytogenetic Abnormalities: Chromosomal, FISH and Microarray-Based Clinical Reporting*, Susan M. Zneimer, Wiley-Blackwell Publishers, Hoboken, NJ, USA, 2014.
- Essays for *Magill's Medical Guide, Sixth Edition*, Salem Press (2011). Title of essay: Biological Therapy.
- Essays for *Salem Science: Applied Science*, Salem Press (2011). Title of essays:
Stem Cell Research and Therapies
Proteomics and Protein Engineering
- Essays for *Salem Health: Infectious Diseases and Conditions* (2011). Title of essays:
Prion diseases
Prion Diagnosis
Treatment and Immune Response of Prion Diseases
Retroviral Infection.
Immune Response of Viral Infections
- Essays for *Salem Health Genetics and Inherited Disorders, Revised Edition*, J. A. Knight, Editor, Salem Press, Pasadena, CA (2010). Titles of essays include:
Genomics
The Human Genome Project