



STEPHEN ALBERT JOHNSTON

Director, Center for Innovations in Medicine
Biodesign Institute
Professor School of Life Sciences
Arizona State University

P.O Box 875901
Tempe, AZ 85287-5901
480-727-0792
Stephen.johnston@asu.edu

Education

1975 University of Wisconsin-Madison, B.S. (Molecular Biology)
1976-1981 University of Wisconsin-Madison, Ph.Ds.
(Genetics/Biochemistry) and (Plant Genetics/Plant Breeding)
1981-1983 The Pennsylvania State University Medical Center
Postdoctoral (Biochemistry)

Research and Professional Experience

2007-Present Director of the Biological Design PhD Program at The Biodesign Institute, Arizona State University
2006-Present Member of Biodesign Institute Directorate, Arizona State University
2005-Present Director, CIM, Biodesign Institute, Professor SOLS, Arizona State University
1999-2005 Professor of Microbiology
1998-2005 Director, Center for Biomedical Inventions
1995-2005 Professor of Internal Medicine
1995-2000 Professor of Biochemistry
1993-2005 Eugene Tragus Chair in Molecular Cardiology
1991/1995 Associate Professor, Internal Medicine and Biochemistry, University of Texas-Southwestern Medical Center

1989-1990 Associate Professor of Biology and Biochemical Engineering

1989-1990 Duke University (Research Career Development Award)

1984-1989 Assistant Professor of Biology and Biochemical Engineering Duke University

1982-1983 NIH Postdoctoral Fellow, Department of Biochemistry, The Pennsylvania State University Medical Center (with Dr. James E.

Hopper), Research: The isolation and characterization of the *GAL4* regulatory gene of yeast.

1981-1982.1.1 Rockefeller Postdoctoral Fellow (with Dr. James E. Hopper)

1975-1981 Graduate Student, Department of Genetics (with Dr. Oliver E. Nelson) and Program in Plant Breeding/Plant Genetics (with Dr. Robert E. Hanneman), University of Wisconsin-Madison. Thesis Title: *The Role and Nature of Genic Balance in Endosperm Development*.

Defense-Related Service:

1997-Present BioChem 20/20 Advisory Committee of Experts (ACE) for Defense Intelligent Agency (Founding member)

2003- Present SAB of Western Regional Center of Excellence for Biodefense and Emerging Infectious Diseases

2004- Present Member, Institute of Medicine Forum on Microbial Threats

Major Scientific Accomplishments:

EBN 1982: Endosperm Balance Number Hypothesis (Science). New concept in how genomes are imprinted to explain interspecific crossing barriers. Widely used now in making new hybrid plants.

GAL 4 1982: Cloning of Gal4 (PNAS). Second eukaryotic regulator cloned (done by Ray Gestland's lab at same time). Established the regulatory protein has dosage effect (had been argued that they would not). Used dosage effect to argue that Gal4 was poised on the promoter in the uninduced state (contrary to existing model and now know to be the case).

PDR 1985: Pathogen-derived resistance (PDR) (J. of Theoretical Biology, with John Sanford). Proposed that genes of virus could be manipulated to confer resistance in host. The concept was renamed "intracellular immunization" 3 years later by David Baltimore (for which he apologized). This technology is now used to make some commercial plants resistant to viral infection.

1986-7: C-terminus of Gal4 required for gene activation and interaction with negative regulator, Gal80. (PNAS, Cell). The discovery of functional domains in Gal4 was actually done in 1984 while I was in Hoppers lab and this was disclosed to the Ptashne lab in 1984.

FIRST ORGANELLE TRANSFORMATION 1988: Mitochondrial Transformation (Science, with John Sanford and Ron Butow). Demonstrated the first transformation of an organelle. This technology is now widely used for mitochondria and chloroplast transformation.

1989 DNA binding specificity of Gal4 zinc-finger is conferred outside of zinc-finger. (Nature, also discovered by Chambon group at same time). This was the first definition of how the DNA binding specificity of zinc fingers is conferred.

GENE GUN 1991. Gene gun. (Technique, with John Sanford). Development of the helium gene gun. This device is commercially available and widely used for plant transformation and genetic vaccination of animals.

IN VIVO ANIMAL TRANSFORMATION 1991. Direct transformation of tissue in living mice with gene gun. (PNAS, with Sandy Williams and John Sanford). This report and the one of Wolff et al were the first of direct transformation of tissues in an animal.

GENE VACCINES 1992. Genetic Immunization (Nature). This was first demonstration that introduction of simple plasmids encoding antigens could elicit an immune response. This was revolutionary approach to immunization and vaccines. It is in phase II and III clinical trials.

1992. Sug genes affect transcription. (Nature). This was the first publication on sequence of Sug1 and its control on transcription.

1993. Structure function studies of Gal4 activation domain. (Cell, with Tom Kodadek). This was one of the first indications that ADs are not simply acid amphipathic helices.

TEV PROTEASE 1993. With Bill Dougherty invented the TEV protease system. This protease is now widely used and arguably the best in the field.

1994-1998. Discovery, crystal structure and activities of Bleomycin hydrolase. (JBC, Science and Cell, with Lemoor Joshua-Tor). We discovered this cysteine protease and delineated its unusual features including the ability to act as a carboxypeptidase, aminopeptidase and peptide ligase. This work revived work on this protein.

1995. Sug1 directly interacts with the AD of Gal4 and thyroid receptor (Nature, with David Moore). This was the demonstration that Sug1 directly interacted with the Gal4 AD and was associated with transcription factors. We later corrected that sug 1 was also in the proteasome. This made most of the field associate transcriptional effects as through the proteolytic effects of the proteasome. The field has turned around on this point after years of uphill battle.

EXPRESSION LIBRARY IMMUNIZATION 1995. Expression Library Immunization. (Nature). This was the demonstration of a technique to unbiasedly test all the genes of a pathogen for their ability to protect against infection. It was the first genomic approach

to vaccine discovery. The technology is robust and in use in MacroGenics and several academic labs. Also the first demonstration of genetic immunization protecting against bacterial infection.

PHAGE PANNING ON CELLS/CELL TARGETING PEPTIDES 1996. Selection of peptide-presenting bacteriophage that bind and transfect mammalian cells (Nature Medicine). This was the first demonstration of selection of peptides on cells that targeted uptake. Variations on this approach are widely used now.

CBI 1998. Started Center for Biomedical Inventions (with Tom Kodadek, Skip Garner, Sandy Williams and Bob Meidell). This was the first center of this type. It is dedicated to inventing blue-sky solutions to basic biomedical problems and reducing to practice with highly interdisciplinary approaches.

BioSignature Diagnostics: 1998. Introduced concept biosignature diagnostics (with Shaun Jones, DARPA) with idea of transforming diagnostics to personal normalized signatures. Emphasis on presymptomatic diagnosis.

LINEAR EXPRESSION ELEMENTS 1999. Linear expression elements. (Nature Biotechnology, with Kathy Sykes). A new method to functionally test genes and promoters in cells or animals without cloning was demonstrated.

1999. A non-proteolytic requirement for the 19S in nucleotide excision repair. (Mol. Cell, with Errol Friedberg). This was the first evidence that the 19S regulatory subunit of the proteasome was required for a cellular function that did not involve proteolysis.

2001. Evidence that the 19S subunit of the proteasome is required for transcriptional elongation. (Mol. Cell, with Tom Kodadek). This was the key report to link the proteasome to transcription in a mode other than degradation.

2002. Gal4 recruits a subunit of the proteasome to the promoter on induction. (Science, with Tom Kodadek). This report was the first evidence that the proteasome units function independently in vivo and that recruitment of the new APIS complex was an early event in transcription.

HTP ANTIBODY PRODUCTION 2004. High through put antibody production. (Nature Biotech). We created a system for the rapid transition of genome sequence into antibodies against the corresponding protein.

IN VIVO PATHOGEN MICROARRAYS 2004. Analysis of gene expression in the pathogen during infection. (PNAS with Rick Lyons). We developed several techniques that allowed us for the first time to analyze the global gene expression patterns of a pathogen in vivo during the course of infection.

Publications

- Magee, M., Stafford, P., Johnston, S.A. 2008. Immunosignaturing to profile humoral immune responses. (submitted)
- Archer, Chase T ; Delahodde, Agnes ; Gonzalez, Fernando ; Johnston, Stephen Albert ; Kodadek, Thomas. 2008. Activation domain-dependent monoubiquitylation of Gal4 protein is essential for promoter binding in vivo. The Journal of biological chemistry. Vol 283. No 18 (2008 May 2) 12614-23
- Kumar, P.K., Y. Yu, R. Sternglanz, S. A. Johnston and L. Joshua-Tor. 2008. NADP regulates the yeast *GAL* induction system. Science. 319: 1090-1092
- Qu, B., Q. Xiang, L. Li, S.A. Johnston, L.S. Hynan and R. N. Rosenberg. 2007. AB42 Gene vaccine prevents AB42 deposition in brain of double transgenic mice. J. Neurological Sci. 260: 204-213.
- Johnston, S.A. 2007. The Potential Importance of Presymptomatic, Host-Based Diagnosis in Biodefence and Standard Health Care. In: Global Infectious Disease Surveillance and Detection. National Academy Press. p193-212.
- Talaat AM, Ward SK, Wu CW, Rondon E, Tavano C et al. (2007) Mycobacterial bacilli are metabolically active during chronic tuberculosis in murine lungs: Insights from genome-wide transcriptional profiling. Journal of Bacteriology 189(11): 4265-4274.
- Anwarul Ferdous, Devanjan Sikder, Thomas Gillette, Kip Nalley, Thomas Kodadek, and Stephen Albert Johnston. 2007. The role of the proteasomal ATPases and activator monoubiquitylation in regulating Gal4 binding to promoters. Genes & Dev. 21: 112-123. (Published in Advance December 13, 2006, 10.1101/gad.1493207)
- A.Ferdous, K. Nalley, M.O'Neal, T. Kodadek and S.A. Johnston. 2007. The Occupancy of Gal4 On An Activated Promoter Is Regulated By Phosphorylation-dependent Ubiquitination of Its DNA-binding Domain (submitted).
- B.Qu, H.Huynh, K.F. Sykes and S.A. Johnston. 2007. Temporal control of immunization by drug-inducible transgene expression. (submitted).
- Lawson, J. and S.A. Johnston. 2006. Amplification of Sense-Stranded Prokaryotic RNA. DNA Cell Biol. 25:627-634

Lawson JN, Lyons CR, Johnston SA (2006) Expression profiling of *Yersinia pestis* during mouse pulmonary infection. *DNA and Cell Biology* 25(11): 608-616

Anwarul Ferdous, Devanjan Sikder, Thomas Gillette, Kip Nalley, Thomas Kodadek, and Stephen Albert Johnston 2006. The 19S complex of the 26S Proteasome Destabilizes Activator-DNA Interactions Independent of Proteolysis (submitted).

Nalley K, Johnston SA, Kodadek T (2006) Proteolytic turnover of the Gal4 transcription factor is not required for function in vivo. *Nature* 442(7106): 1054-1057.

Qu, B, P.Boyer, S.A. Johnston, L. Hynan and R. Rosenberg. 2006. Abeta-42 gene vaccination reduces brain amyloid plaque burden in transgenic mice. *J. Neurol. Sci.* 244: 151-158.

Chen, S. J. Ding, R. Bereredjian, B, Yang, R. Shohet, S. A. Johnston, H. Hohmeier, C. Newgard and P. Grayburn. 2006. Efficient gene delivery to pancreatic islets with ultrasonic microbubble destruction technology. *Proc. Natl. Acad. Sci.* 103: 8469-8474.

Sulahian R, Johnston SA, Kodadek T (2006) The proteasomal ATPase complex is required for stress-induced transcription in yeast. *Nucleic Acids Research* 34(5): 1351-1357.

Gillette TG, Yu SR, Zhou Z, Waters R, Johnston SA et al. (2006) Distinct functions of the ubiquitin-proteasome pathway influence nucleotide excision repair. *Embo J* 25(11): 2529-2538.

Sikder D, Johnston SA, Kodadek T (2006) Widespread, but non-identical, association of proteasomal 19 and 20 S proteins with yeast chromatin. *Journal of Biological Chemistry* 281(37): 27346-27355.

Samli, Kausar N., McGuire, Michael J., Newgard, Christopher B., Johnston, Stephen Albert, Brown, Kathlynn C. (2005) "Peptide Mediated targeting to the Islets of Langerhans" *Diabetes*, 54, 2103-2108..

De, Jitakshi, Chang, Ya-Ching, Samli, Kausar N., Schisler, Jonathan, Newgard, Christopher B., Johnston, Stephen Albert, Brown, Kathlynn C., (2005) "Isolation of a Mycoplasma-specific binding peptide from unbiased phage-displayed peptide library" *Molecular Biosystems*, 1, 149-157.

Magee D.M., Friedberg, RL., Woitaske, M.D., Johnston, S.A., Cox, R.A. Role of B cells in vaccine-induced immunity against coccidioidomycosis. *Infect. Immun.* 73:7011-7013, 2005.

Solis C.F., Ostoa-Saloma P., Lugo-Martinez V.H., Johnston S.A., Laclette J.P. Related Articles, Links Genetic vaccination against murine cysticercosis by using a plasmid vector carrying *Taenia solium* paramyosin. *Infect Immun.* 2005 73: 1895-7.

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- Qu, Bao-Xi, R. Rosenberg, L. Li, P.J. Boyer and S.A. Johnston. 2004. Genetic vaccination to bias the immune response to amyloid beta peptide as therapy for alzheimers. Archives of Neurobiology. 61: 1859-1864 (Commentary p1832).
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- Gillette, T., Gonzalez, F., Delahodde, A., Johnston, S.A., Kodadek, T. 2004. Physical and Functional Association of RNA Polymerase II and the Proteasome. PNAS. 101(16):5904-5909.
- Talaat, A.M., R. Lyons, S. Howard and S.A. Johnston. 2004. The temporal expression profile of Mycobacterium tuberculosis infection in mice.. PNAS. 101(13):4602-7.
- Oyama, T, Sykes KF, Samli KN, Minna JD, Johnston SA, Brown KC. 2003. Isolation of lung tumor specific peptides from a random peptide library: generation of diagnostic and cell-targeting reagents. Cancer Letter. 202(2):219-30.
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- Ferdous, A., Kodadek, T.J. and S.A. Johnston. 2002. A Nonproteolytic Function of the 19S Regulatory Subunit of the 26S Proteasome Is Required For Efficient Activated Transcription by Human RNA Polymerase II. Biochemistry. 41 (42):12798-12805
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- Talaat, A., H. Garner, S. Howard, R. Lyons and S.A. Johnston. 2002. Genomic DNA standards for gene expression profiling in *Mycobacterium tuberculosis*. Nucleic Acids Research 30 (20):1-9.
- Johnston, S.A. 2002. Genetic Immunization: What's in a name? Archives of Medical Research 33:325-329.
- Gonzalez, F., A. Delahodde, T. Kodadek and S.A. Johnston. 2002. Recruitment of a 19S proteasome subcomplex to an activated promoter. Science 296: 548-550.
- Sykes, K., M.G. Lewis, B. Squires and S.A. Johnston. 2002. Evaluation of SIV expression library vaccines in a macaque challenge. Vaccine 20:2382-2395.
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- Talaat, A., R. Lyons and S.A. Johnston. 2001. A combination vaccine confers full protection against co-infection with influenza, herpes simplex and respiratory syncytial viruses. Vaccine 20:538-544.
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- Russell, S. J. and S.A. Johnston. 2001. Evidence that proteolysis of Gal4 can not explain the transcriptional effects of proteasome ATPase mutations. J. Biological Chemistry. 276 (13): 9825-9831.
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Patents and Licenses

1. Linear and circular expression elements. Patents and Licensed (S.A. Johnston/K. Sykes, co-inventors)
2. Rationally designed and chemically synthesized promoter for genetic vaccine and gene therapy (B. Qu, co-inventor) (pending)
Methods and compositions for vaccination comprising nucleic acid and/or polypeptide sequences of the genus *Borrelia* (Lyme Disease) (K. Sykes, K. Stemke-Hale, co-inventors) (filed)
3. Use of Parapox B2L Protein to Modify Immune Responses to Administered Antigens (M. McGuire, co-inventor) (patented)
4. Methods and compositions for vaccination comprising nucleic acid and/or polypeptide sequences of chlamydia. (filed)
5. Methods and compositions for vaccination comprising nucleic acid and/or polypeptide sequences of chlamydia psittaci. (K. Sykes, K. Stemke-Hale and B. Kaltenboeck co-inventors) (filed)
6. Methods for rapid and efficient protein-crosslinking. (T. Kodadek and D. Fancy, co-inventors) (patented)
7. A new high throughput DNA synthesizer based on masks. (E. Livesay and S. Liu, co-inventors) (pending)
8. Expression library immunization. (W. Lai and M. Barry, co-inventors) (patented & licensed)
9. A simple system for purifying authentic proteins and peptides (William Dougherty, co-inventor) (patented & licensed)

10. Genetic immunization as a simple and improved method for eliciting an immune response (John Sanford, co-inventor) (pending & licensed)
11. An improved biolistic device (J. Sanford and M. Devit, co-inventors) (patented & licensed). This is for the helium device sold by BioRad.
12. A method for isolating protease encoding genes. (Bruce Kohorn, co-inventor) (licensed)
13. Parasite-derived resistance (John Sanford, co-inventor) (patented).