

## CURRICULUM VITAE

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### EDUCATION

Ph.D. Plant Biology, 1983, University of Illinois, Urbana  
B.S. *cum laude*, Botany, 1978, University of Florida, Gainesville

### EMPLOYMENT

2004- present Professor of Pharmacology, University of North Carolina-Chapel Hill  
1999- present Professor of Biology, University of North Carolina-Chapel Hill  
1992-1999, Associate Professor of Biology, Univ. of North Carolina-Chapel Hill  
1986-1992 Assistant Professor of Biology, Univ. of North Carolina-Chapel Hill  
1983-1986 Res. Associate with Dr. Peter Quail, Botany, Univ. of Wisconsin  
1982-1983 Research Assistant with Dr. David Ho, Univ. of Illinois.  
1981-1982 Research Assist. with Dr. Fred Meins, Friedrich Miescher Inst. in Basel.  
1978-1981 Res Assist. for Dr. Larry Vanderhoef, Plant Biology, Univ. of Illinois.

### PROFESSIONAL

2004 NIH Study Section, Immunology Fellowships  
2003- DOE Bioscience Program, panel member  
2002- NSF, Cell Biology Signal Transduction, two-term panel member  
2002- NIH study section member, SSS-Y  
2001 USDA NRICGO, Panel Manager  
1999 NIH Study Section, Molecular Biology, CDF-1  
1991-1998 Editor, *Plant Physiology*  
1998- Faculty member in Program in Genetics and Molecular Biology  
1997- Faculty member in Program in Cell Biology  
1991-1996, Faculty member in the Program for Protein Engineering and Molecular Biology  
1999- Editorial Board, *J. Plant Growth Regulation*  
1992-1996 Associate Editor, *J. Plant Growth Regulation*  
Member: AAAS, IPGSA, ISPMB, ASCB, ASPP, NCAS  
1991-1993 USDA NRICGO, panel member  
BARD Program CoChairman, 1995; BARD Chairman 1996

## HONORS AND AWARDS

1996 Alexander von Humboldt Research Fellow  
1987 John T. Lupton Award for Teaching Improvements  
1987 IBM Junior Faculty Award  
1982 University of Illinois Competitive Graduate Research Award

## PUBLICATIONS (Peer-reviewed)

- Joo, JH, Wang, S, Chen, JG, Jones, AM, Federoff, NV 2005 Different Signaling and Cell death Roles of Heterotrimeric G Protein  $\alpha$  and  $\beta$  Subunits in the *Arabidopsis* Oxidative Stress Response to Ozone. *Plant Cell* (in press)
- Huang, J, Taylor, JP, Chen, JG, Wang, M, Uhrig, JF, Nakagawa, T, Korth, KL, Jones, AM A Role for Signaling Between Plastids and the Plasma Membrane in G-Protein Coupled Sugar Sensing *Plant Cell* (under review)
- Fan, L, Chen, J-G, Jones, AM, Assmann, SM Heterotrimeric G-protein regulation of guard-cell inwardly-rectifying  $K^+$  channels in  $G\beta$  and RGS1-deficient *Arabidopsis* lines. *Proc. Natl. Acad. Sci. USA* (under review)
- Chen, J-G, Wang, S, Lazarus, CM, Napier, RM, Jones, AM Altered expression of auxin-binding protein 1 affects cell proliferation and auxin pool size in tobacco cells. *J. Plant Growth Regulation* (under review)
- Yu, X-H, Jones, B, Jones, AM, Heimer, YM A protease activity displaying some thrombin-like characteristics in conditioned medium of zinnia mesophyll cells undergoing tracheary element differentiation *J. Plant Growth Regulation* (in press)
- Wang, Q, Sullivan, RW, Kight, A, Henry, RL, Jones, AM, Korth, KL (2004) Deletion of the chloroplast-localized THYLAKOID FORMATION1 gene product in *Arabidopsis thaliana* leads to deficient thylakoid formation and variegated leaves. *Plant Physiology* 136: 3594-3604
- Booker, FL, Burkey, KO, Overmyer, K, Jones, AM (2004) Differential responses of G-protein *Arabidopsis thaliana* mutants to ozone. *New Phytologist* 162: 633-641
- Chen, JG, Pandey, S, Huang, J, Alonso, JM, Ecker, JR, Assmann, SM, Jones, AM (2004) GCR1 acts independently of heterotrimeric G protein in response to brassinosteroids and gibberellic acid in *Arabidopsis* seed germination *Plant Physiol.* 135:907-915
- Miles, GP, Samuel, MA, Jones, AM, Ellis, BE (2004) Mastoparan rapidly activates plant MAP Kinase signaling independent of heterotrimeric G proteins. *Plant Physiol.* 134: 1332-1336
- Pufky, J., Qiu, Y., Rao, M. V., Hurban, P. Jones, A. M. (2003) The auxin-induced transcriptome for etiolated *Arabidopsis* seedlings using a structure/function approach. *Functional Integrative Genomics.* 3:135-143
- Dharmasiri, N., Dharmasiri, S., Jones, A. M., Estelle, M. (2003) Auxin action in a cell-free system. *Curr. Biol.* 13: 1418-1422
- Chen, Jin-Gui, Willard, F.S., Huang, J., Liang, J., Chasse, S.A., Jones, A. M., Siderovski, D.P. (2003) A Seven-transmembrane RGS protein that modulates plant cell proliferation. *Science* 301: 1728-1731

- Hayashi, K., Jones, A.M., Ogino, K., Yamazoe, A., Oono, Y., Inoguchi, M., Kondo, H. and Nozaki, H. (2003) Yokonolide B, a novel inhibitor of auxin action, blocks degradation of Aux/IAA factors. *J. Biol. Chem.* **278**: 23797-23806
- Jones, AM, Ecker, JR, Chen J-G (2003) A Re-evaluation of the role of the heterotrimeric G protein in coupling light responses in Arabidopsis. *Plant Physiol.* **131**: 1623-27
- Ullah, H., Chen, J-G., Temple, B., Boyes, D.C., Alonso, J.M., Davis, K.R., Ecker, J.R., Jones, A.M. (2003) The beta subunit of the Arabidopsis G protein negatively regulates auxin-induced cell division and affects multiple developmental processes. *Plant Cell* **15**: 393-409
- Groover, A., Chen, J-G., Pattishall, A., and Jones, A.M. (2003) Auxin regulation of *Arabidopsis* *IAA8* and zinnia *zIAA8* in vascular development. *Plant Mol. Biol.* **51**: 427-435 *featured on the cover*
- Höglund, A-S., Jones, A.M., and Josefsson, L-G. (2002) An antigen expressed during plant vascular development cross-reacts with antibodies towards KLH, keyhole limpet hemocyanin *J. Histochem.* **50**:999-1003
- Ullah, H, Chen, J-G., Wang, S. Jones, A.M. (2002) Role of G $\alpha$  in regulation of *Arabidopsis* seed germination. *Plant Physiol* **129**: 897-907
- Yu, X., Perdue, A, Heimer, Y., Jones, A. (2002) Mitochondrial participation in tracheary element cell death. *Cell Death and Differentiation* **9**: 189-198
- Chen, J-G., Shimomura, S., Sitbon, F., Sandberg, G., Jones, A.M. (2001) Role of auxin-binding protein 1 in leaf cell growth. *Plant J.* **28**:607-617.
- Wang, X-Q., Ullah, H., Jones, A.M., Assmann, SM (2001) G-protein regulation of ion channels and abscisic acid signaling in *Arabidopsis* guard cells *Science* **292**: 2070-2072
- Ullah, H. Chen, J. G., Young, J., Im, K-H., Sussman, MR., Jones, AM (2001) Modulation of Cell Proliferation by Heterotrimeric G-protein in *Arabidopsis*. *Science* **292**: 2066-2069
- Fischer-Iglesias, C, Sundberg, B, Neuhaus, G and Jones, A.M. (2001) Auxin distribution and transport during embryonic pattern formation in wheat *Plant J.* **26**: 115-129.
- Chen, J, Ullah, H., Young, J.C., Sussman, M.R., Jones, A.M (2001) ABP1 is required for organized cell elongation and division in *Arabidopsis* embryogenesis. *Genes and Development* **15**:902-911. *featured on the cover*
- Im, K., Chen, J-G., Meeley, R., Jones, A.M (2001) Auxin-binding protein mutants in maize. *Maydica* **45**: 319-325
- Im, H, Cosgrove, D, Jones, AM (2000) Subcellular localization of expansin mRNA in xylem cells. *Plant Physiol.***123**: 463-470. *featured on the cover*
- DeWitt, G., Richards, J., Mohnen, D. Jones, A.M. (1999) Comparative compositional analysis of walls with two different morphologies: archetypical versus transfer-cell like. *Protoplasma* **209**: 238-245
- Groover, A., Jones, A.M. (1999) Tracheary element differentiation uses a novel mechanism coordinating programmed cell death and secondary cell wall synthesis. *Plant Physiology* **119**:375-384. *featured on the cover*
- Jones, A. M. , Im, K-H., Savka, M., Wu, M-J., DeWitt, N.G., Shillito, R. Binns, A. (1998) Auxin-dependent cell expansion mediated by overexpressed auxin-binding protein 1. *Science* **282**: 1114-1117
- Brown, J. C., Prasad, P., Wu, M-J., Irzyk, G.P. Jones, A. M. (1998) Purification of a 65-kilodalton Nuclear Protein with Structural Homology to Glutathione-S-transferase. *Plant Science* **136**: 227-236.

- Shinkle, J. R., Kadakia, R., Jones, A. M. (1998) Dim-red-light induced increase in polar auxin transport in cucumber seedlings: I. Development of altered capacity, velocity, and response to inhibitors. *Plant Physiol.* **116**: 1505-1513
- Barker-Bridgers, M., Ribnicky, D.M., Cohen, J.D. Jones, A.M. (1998) Red-light regulated growth. II. Changes in the abundance of indoleacetic acid in the maize mesocotyl. *Planta* **204**: 207-211
- Groover, A.T., DeWitt, N.G., Heidel, A.J., Jones, A.M. (1997) Programmed cell death of plant tracheary elements differentiating *in vitro*. *Protoplasma* **196**: 197-211.
- Tian, H., Klambt, D. and Jones, A.M. (1995) Auxin-binding protein 1 does not bind auxin within the endoplasmic reticulum despite this being the predominant subcellular location for this hormone receptor. *J. Biol. Chem.* **270**:26962-26969
- Harnden, D. and Jones, A.M. (1995) Organ localization of auxin-binding protein 1 in the etiolated maize seedling. *J. Plant Growth Reg.* **14**:109-113
- Brown, J. C. and Jones, A. M. (1994) Mapping the auxin-binding site of auxin-binding protein 1. *J. Biol. Chem.* **269**: 21136-21140
- Edgerton, M.D. Tropsha, A. and Jones, A.M. (1994) The auxin-binding site of auxin-binding protein 1. *Phytochemistry* **35**:1111-1123
- Edgerton, M.D. and Jones, A.M. (1993) Subunit interactions in the carboxy-terminal domain of phytochrome. *Biochemistry* **32**:8239-8245
- Edgerton, M.D., Santos, M., and Jones, A. M. (1993) *In vivo* suppression of phytochrome aggregation by the GroE chaperonins in *E. coli*. *Plant Mol Biol.* **21**: 1191-1194
- Jones, A. M. and Herman, E. (1993) KDEL-containing, auxin-binding protein is secreted to the plasma membrane and cell wall. *Plant Physiol.* **101**:595-606
- Frances, S., White, M.J., Edgerton, M. D., Jones, A.M., Elliot, R.C., and Thompson, W.F. (1992) Initial characterization of a pea mutant with light-independent photomorphogenesis. *Plant Cell* **4**: 1519-1530
- Edgerton, M.E. and A.M. Jones (1992) Localization of protein-protein interaction between the subunits of phytochrome. *Plant Cell* **4**:161-171
- Jones, A.M, D.S. Cochran, P.L. Lamerson, J. Cohen, M. Evans (1991) Red- light induced changes in auxin, an auxin-binding protein, and auxin transport in maize mesocotyl. *Plant Physiol.* **97**:352-358
- Prasad, P.V., A.M. Jones (1991) A putative receptor for the plant growth hormone, auxin identified and characterized by anti- idiotypic antibodies. *Proc. Natl. Acad. Sci. USA* **88**:5479-5483.
- Macdonald, H., A.M. Jones, P.J. King (1991) Photoaffinity labeling of soluble auxin-binding proteins. *J. Biol. Chem.* **266**:7393-7399
- Zhou, S., A.M. Jones, T.K. Scott (1990) Phytochrome-mediated Swelling of Etiolated Leaf Protoplasts and Its Possible *In vivo* Significance. *Plant Cell Reports* **9**:435-438
- Jones, A.M., P. Lamerson, M.A. Venis (1989) Comparison of Site I Auxin Binding and a 22-Kilodalton Auxin-binding Protein in Maize. *Planta* **179**:409-414
- Jones, A.M. (1990) Location of Transported Auxin in Etiolated Maize Shoots Using 5-azidoindoleacetic acid. *Plant Physiol.* **93**:1154-1161
- Jones, A.M., M.A. Venis (1989) Photoaffinity Labeling of Auxin-Binding Proteins in Maize. *Proc. Natl. Acad. Sci. USA* **86**:6153-6156
- Hicks, G. R., Rayle, D. L., Jones, A. M., Lomax, T. L. (1989) Specific Photoaffinity Labeling of Two Plasma Membrane Polypeptides with an Azido Auxin. *Proc. Natl. Acad. Sci. USA* **86**:4948-4952

- Jones, A.M., P.H. Quail (1989) Phytochrome Structure: Peptide fragments from the amino-terminal domain involved in protein- chromophore interactions. *Planta* **178**:147-156
- Jones, A.M., H.P. Erickson (1989) Domain Structure of Phytochrome from *Avena sativa* Visualized by Electron Microscopy. *Photochem. Photobiol.* **49**:479-483
- Parks, B.M., A.M. Jones, P. Adamse, M. Koorneef, R.E. Kendrick, and P.H. Quail (1987) The Aurea Mutant of Tomato is Deficient in Spectrometrically and Immunochemically Detectable Phytochrome. *Plant Mol. Biol.* **9**:97-108.
- Jones, A.M., C.D. Allen, G. Gardner, and P.H. Quail (1986) Synthesis of Phytochrome Apoprotein and Chromophore are not Coupled Obligatorily. *Plant Physiol.* **81**:1014-1016.
- Jones, A.M. and P.H. Quail (1986) Quaternary Structure of 124-Kilodalton Phytochrome from *Avena sativa* L. *Biochemistry* **25**:2987- 2995.
- Jones, A.M., R.D. Vierstra, S.M. Daniels, and P.H. Quail (1985) The Role of Separate Molecular Domains in the Structure of Phytochrome from Etiolated *Avena sativa* L. *Planta* **164**:501-506.
- Jones, A.M., L.L. Melhado, T.-H.D. Ho, C.J. Pearce, and N.J. Leonard (1984) Azido Auxins: Photoaffinity Labeling of Auxin-Binding Proteins in Maize Coleoptile with Tritiated 5- azidoindole-3- acetic acid. *Plant Physiol* **75**:1111-1116.
- Melhado, L.L., A.M. Jones, T.-H.D. Ho, and N.J. Leonard (1984) Azido Auxins: Photolysis in Solution and Covalent Binding to Soybean. *Plant Physiol* **74**:289-294.
- Jones, A.M., L.L. Melhado, T.-H.D. Ho, and N.J. Leonard (1984) Azido Auxins: Quantitative Binding Data in Maize. *Plant Physiol.* **74**:294-302.
- Melhado, LL, Jones, AM, Leonard, NJ, Vanderhoef LN(1981) Azido Auxins: Synthesis and Biological Activity of Fluorescent Labeling Agents. *Plant Physiol.* **68**:469- 475.
- Jones, A.M. and L.N. Vanderhoef (1980) The Effect of Abrading the Cuticle. *J. Expt. Bot.* **32**:405-410.

Book Chapters and Invited Reviews (\*peer-reviewed):

- Perfus-Barbeoch, L, Jones, A. M., Assmann, S. M. (2004) Plant heterotrimeric G protein function: insights from Arabidopsis and rice mutants. *Curr. Op. Plant Biol.* **7**:719-731
- Jones, AM, Ullah, H, Chen, J-G (2004) Dual pathways for auxin regulation of cell division and expansion. In Tobacco BY-2 Cells, Series: Biotechnology in Agriculture and Forestry, Nagata, T, Lörz, H, Widholm, JM eds. Vol 53, Springer, Tokyo
- Chen, J-G., Jones, A. M. (2004) AtRGS1 function in Arabidopsis. *Meth. Cell Enzymol.* **389**: 338-350
- \*Jones, A.M. and Assmann, S. M. (2004) Plants: the latest model system for G-protein research *EMBO Reports* **5**: 572-578
- \*Beers, E. P., Jones, A. M., Dickerman, A. W. (2004) The S8 serine, C1A cysteine and A1 aspartic protease families in Arabidopsis. *Phytochemistry* **65**: 43-58
- \*Jones, AM (2002) G-protein-coupled signaling in Arabidopsis. *Curr. Opin. Plant Biol.* **5**:402-407
- \*Jones, A. M. ed. 2001 *Special Edition on Auxins. J. Plant Growth Reg.* Vol. 20 number 3
- Jones, A. M., A. Groover, X Yu, T. Perdue (2001) Final and fatal step of tracheary element differentiation. In Molecular Breeding of Woody Plants, N. Morohoshi and A. Komamine, eds. Elsevier Science B. V. pp. 29-42

- \*Jones, A M (2001) Programmed cell death in development and defense. *Plant Physiol.* **125**: 94-97
- Jones, A.M. (2000) Does the plant mitochondrion integrate cellular stress and regulate programmed cell death? *Trends in Plant Sciences* **5**, 225-230
- Jones, Alan M., Silvia Coimbra, Angelika Fath, Mariana Sottomayer and Howard Thomas Various "Methods for Study of Cell Death in Plants" *In Cell Death*, Second Edition, Larry Schwartz and Jonathan Ashwell, eds. Methods in Cell Biology Academic Press, San Diego
- Jones, A.M. (1999) Manipulation of fiber content in plants. *AgriNews* 1: 1-4
- Jones, A.M. (1999) Textbook review 'Introduction to Plant Physiology, 2<sup>nd</sup> edition by William C. Hopkins', American Society for Biology Bulletin
- Jones, A.M. (1998) Auxin transport: Down and out and up again. *Science* **282**: 2201-2202
- Jones, A.M. and Dangl, J. D. (1996) Logjam at the Styx: The multiplicity of programmed cell death in plants. *Trends in Plant Science* **1**: 114-119
- Jones, A.M. and Lomax, T. L. (1996) Photoaffinity labeling with 5-azidoindole-3-acetic acid. In *Plant Biochemistry and Molecular Biology*, CRC Press, pp. 115-132
- \*Jones, A.M. and Edgerton, M. D. (1994) The Anatomy of phytochrome: a unique photoreceptor in plants. *Seminars in Cell Biology* **5**:295-302
- Jones, A. M. (1994) Surprising signals in plants. *Science* **263**:183-184
- Jones, A. M. (1994) Auxin-binding proteins. *Annu. Rev. Plant Physiology and Plant Molecular Biology* **45**:393-420
- Jones, A. M. (1993) Auxin-binding proteins and their possible role in cell development. Cellular Communication in Plants. Amasino, R., ed., Plenum, NY
- \*Jones, A.M. (1992) What remains of the Cholodney-Went theory? Assymetric redistribution of auxin need only occur over the distance of one cell width. *Plant Cell Environ.* **15**: 775-776. *featured on the cover*
- Jones, A.M., P.V. Prasad (1991) Auxin-binding proteins and their possible roles in auxin-mediated plant growth. *BioEssays* **14**:43-48
- Jones, A.M. 1990 Do We Have the Auxin Receptor Yet? *Physiol. Plant.* **80**:154-158
- Quail, P.H., Christensen, A.C., Jones, A.M., Lissemore, J.L., Parks, B.M., Sharrock, R.A. (1987) The Phytochrome Molecule and the Regulation of its Genes. In 4th FOAB Congress, Integration and Control of Metabolic Processes: Pure and Applied Aspects, ICSU Press. pp 41-54
- Jones, AM Venis, MA (1987) Photoaffinity Labeling of auxin-binding proteins in maize. In "Physiology and Biochemistry of Auxins in Plants" Kutacek, Bandurski, Krekule, eds.
- Jones, AM (1987) The effect of low fluence red light on growth and NAA binding. In "Physiology and Biochemistry of Auxins in Plants" Kutacek, Bandurski, Krekule, eds.
- Quail, P.H., Barker, R.F., Colbert, J.T., Daniels, S.M., Hershey, H.P., Idler, K.B., Jones, A.M., and Lissemore, J.T. (1986) In Molecular Biology of Plant Growth Control, UCLA Symposium on Molecular and Cellular Biology, Alan R. Liss, Inc., pp 425-439
- Quail, P.H., Gatz, C., Hershey, H.P., Jones, A.M., Lissemore, J.L., Parks, B.M., Sharrock, R.A., Barker, R.F., Idler, K., Murray, M.G., Koorneef, M., Kendrick, R.E. (1987) Molecular Biology of Phytochrome. In Phytochrome and Photoregulation in Plants, Furuya, ed., Academic Press, pp 23-37
- Trewavas, A.J. and A.M. Jones (1981) Consequences of hormone binding studies for plant growth research. *What's New in Plant Physiology?* **12**:5-8.

Starling, R.J., A.M. Jones, and A.J. Trewavas (1985) Putative Plant Hormone Receptors. What's New in Plant Physiology? 15:37-40  
Jones, A.M., A.S.N. Reddy, 1992 Auxin. McGraw-Hill Yearbook of Science and Technology

### **INVENTION DISCLOSURES AND PATENTS (UNC-CH only)**

ORS94-78 In vivo expression system for detection of homotypic protein-protein interactions

OTD96-91 A controllable genetic mechanism to increase the growth rate of plants

OTD98-25 A genetic mechanism to increase the growth rate of plants

OTD00-101 Plant cell expansion control by ABP1. (Patent Pending)

OTD02- Hyperpolarization-activated  $Ca^{++}$  channels as reporters for membrane hyperpolarization

Docket # 2155P Methods of improving plant agronomic traits by altering the expression of plant G proteins alpha and beta. (Patent Pending)

### **MAJOR PRESENTATIONS (1986-present)**

"Plastid to Plasma Membrane Signaling in Sugar Sensing Involves the Heterotrimeric G Protein Complex" BASF, RTP, NC Jan 21, 2005

"Heterotrimeric G-Protein-coupled Sugar Sensing in Plants" Iowa State University, Ames, IA, November 11, 2004

"Sugar sensing coupled by Heterotrimeric G protein in Arabidopsis" Virginia Polytechnic Institute, Blacksburg, VA Nov. 5<sup>th</sup>, 2004

"G Protein-Coupled Sugar Sensing in Arabidopsis" University of Florida, Gainesville, FL Oct. 13<sup>th</sup>, 2004

"G-protein coupled Sugar Sensing in Arabidopsis Involving a Novel Plastid Protein", Invited Speaker, Biochemical Society Focused Meeting, Royal Agricultural College, Cirencester, UK, September 25-29, 2004

"Role of a Seven-transmembrane RGS Protein in Sugar Sensing in Arabidopsis", Invited Speaker, ASPB Ann Meeting, Orlando, July 24-29<sup>th</sup>, 2004

"Auxin-binding protein 1" Auxin 2004 Kolympari Crete, May 2004

"G-protein coupled sugar signaling in Arabidopsis" University of Illinois, May 5, 2004

"G-protein coupled signal transduction in Arabidopsis" Dept. Pharmacology, UNC Dec. 2003

"Cell division control in roots: Two separate mechanisms coupled by a heterotrimeric G protein" NC Biotechnology Plant Consortium Retreat, Asheville, Sept. 2003

"G-coupled signaling in Arabidopsis" Dept. Botany, Univ. Tennessee, Mar. 27, 2003.

"University-Industry Relationships and the public good, the bad, and the ugly", Agricultural Biotechnology Workshop held Nov. 19-20, RTP, NC invited panelist

"Role of the beta subunit of Arabidopsis Heterotrimeric G Protein in Controlling Cell Division" Dept. Biology, Penn State Univ. Oct. 15<sup>th</sup>, 2002

"Role of the Mitochondria in Programmed Cell Death During Tracheary Element Differentiation" Am. Phytopathological Society, Symposium Speaker, July 28<sup>th</sup>, 2002

"Life in the Fastlane- a Perspective from a Principal Investigator" Burroughs Wellcome Fund sponsored Conference on Electronic Grantmaking, Research Triangle Park, June 5-6, 2002





















