

## CURRICULUM VITAE

February, 2007

Name: David Rhodes

Birth Date: December 13, 1951

Rank: Professor

### Academic Record:

<u>Degrees received</u>	<u>Institution</u>	<u>Date</u>
B.Sc. (1st class Hons.; Botany)	University of Manchester (U.K.)	1973
Ph.D. (Plant Physiology)	University of Manchester (U.K.)	1976

### Dates and Rank of Appointments Held:

- September 1976 - October 1978; Science Research Council Postdoctoral Research Fellow, School of Biological Sciences, University of East Anglia, Norwich (U.K.).
- January 1979 - December 1979; Postdoctoral Research Associate, MSU-DOE Plant Research Lab., Michigan State University, East Lansing, MI.
- January 1980 - July 1985; Senior Research Biologist, Zoecon Corporation, Palo Alto, CA.
- July 1985 - March 1991; Associate Professor, Horticulture and Landscape Architecture Dept., Purdue University, West Lafayette, IN.
- March 1991 - Present; Professor, Horticulture and Landscape Architecture Dept., Purdue University, West Lafayette, IN.

### Current Membership of Scientific, Professional and Honorary Organizations:

Member of American Association For the Advancement of Science.

### Publications:

- Rhodes, D. and Stewart, G.R. 1974. A procedure for the *in vivo* determination of enzyme activity in higher plant tissue. *Planta* 118: 133-144.
- Rhodes, D., Rendon, G.A. and Stewart, G.R. 1975. The control of glutamine synthetase level in *Lemna minor* L. *Planta* 125: 201-211.
- Rhodes, D., Rendon, G.A. and Stewart, G.R. 1976. The regulation of ammonia assimilating enzymes in *Lemna minor*. *Planta* 129: 203-210.
- Stewart, G.R. and Rhodes, D. 1977. Control of enzyme levels in the regulation of nitrogen assimilation. *In* (H. Smith, ed.), "Regulation of Enzyme Synthesis and Activity in Higher Plants", Academic Press, London, pp. 1-22.
- Stewart, G.R. and Rhodes, D. 1976. Evidence for the assimilation of ammonia via the glutamine pathway in nitrate-grown *Lemna minor* L. *FEBS Letters* 64: 296-299.
- Stewart, G.R. and Rhodes, D. 1977. A comparison of the characteristics of glutamine synthetase and glutamate dehydrogenase from *Lemna minor* L. *New Phytologist* 79: 257-268.
- Stewart, G.R. and Rhodes, D. 1978. Nitrogen metabolism of halophytes III. Enzymes of ammonia assimilation. *New Phytologist* 80: 307-316.

- Rhodes, D., Sims, A.P. and Stewart, G.R. 1979. Glutamine synthetase and the control of nitrogen assimilation in *Lemna minor* L. In (E.J. Hewitt, C.V. Cutting, eds.) "Nitrogen Assimilation of Plants", Academic Press, London, pp. 59-78.
- Rhodes, D., Sims, A.P. and Folkes, B.F. 1980. Pathway of ammonia assimilation in illuminated *Lemna minor*. *Phytochemistry* 19: 357-365.
- Hitz, W.D., Rhodes, D. and Hanson, A.D. 1981. Radiotracer evidence implicating phosphoryl and phosphatidyl bases as intermediates in betaine synthesis by water-stressed barley leaves. *Plant Physiology* 68: 814-822.
- Rhodes, D., Myers, A.C. and Jamieson, G. 1981. Gas chromatography-mass spectrometry of N-heptafluorobutyryl isobutyl esters of amino acids in the analysis of the kinetics of [<sup>15</sup>N]H<sub>4</sub><sup>+</sup> assimilation in *Lemna minor* L. 1981. *Plant Physiology* 68: 1197-1205.
- Hanson, A.D. and Rhodes, D. 1983. <sup>14</sup>C tracer evidence for synthesis of choline and betaine via phosphoryl base intermediates in salinized sugar beet leaves. *Plant Physiology* 71: 692-700.
- Rosenthal, G.A. and Rhodes, D. 1984. L-Canavanine transport and utilization in developing jack bean, *Canavalia ensiformis* (L.) DC. [Leguminosae]. *Plant Physiology* 76: 541-544.
- Hanson, A.D., May, A.M., Grumet, R., Bode, J., Jamieson, G.C. and Rhodes, D. 1985. Betaine synthesis in chenopods: Localization in chloroplasts. *Proc. Natl. Acad. Sci. USA* 82: 3678-3682.
- Yamaya, T., Oaks, A., Rhodes, D. and Matsumoto, H. 1986. Synthesis of [<sup>15</sup>N]glutamate from [<sup>15</sup>N]H<sub>4</sub><sup>+</sup> and [<sup>15</sup>N]glycine by mitochondria isolated from pea and corn shoots. *Plant Physiology* 81: 754-757.
- Rhodes, D., Handa, S. and Bressan, R.A. 1986. Metabolic changes associated with adaptation of plant cells to water stress. *Plant Physiology* 82: 890-903.
- Rhodes, D., Deal, L., Haworth, P., Jamieson, G.C., Reuter, C.C. and Ericson, M.C. 1986. Amino acid metabolism of *Lemna minor* L. I. Responses to methionine sulfoximine. *Plant Physiology* 82: 1056-1062.
- Rhodes, D., Hogan, A.L., Deal, L., Jamieson, G.C. and Haworth, P. 1987. Amino acid metabolism of *Lemna minor* L. II. Responses to chlorsulfuron. *Plant Physiology* 84: 775-780.
- Rhodes, D., Rich, P.J., Myers, A.C., Reuter, C.C. and Jamieson, G.C. 1987. Determination of betaines by fast atom bombardment mass spectrometry: Identification of glycine betaine deficient genotypes of *Zea mays*. *Plant Physiology* 84: 781-788.
- Rhodes, D. 1987. Metabolic responses to stress. In (D.D. Davies, ed.) "The Biochemistry of Plants", Vol 12, Academic Press, New York, pp. 201-241.
- Binzel, M.L., Hasegawa, P.M., Rhodes, D., Handa, S., Handa, A.K. and Bressan, R.A. 1987. Solute accumulation in tobacco cells adapted to NaCl. *Plant Physiology* 84: 1408-1415.
- LaRosa, P.C., Hasegawa, P.M., Rhodes, D., Clithero, J.M., Watad, A.-E.A. and Bressan, R.A. 1987. Abscisic acid stimulated osmotic adjustment and its involvement in adaptation of tobacco cells to NaCl. *Plant Physiology* 85: 174-181.
- Brunk, D.G. and Rhodes, D. 1988. Amino acid metabolism of *Lemna minor* L. III. Responses to aminoxyacetate. *Plant Physiology* 87: 447-453.
- Rhodes, D., and Rich, P.J. 1988. Preliminary genetic studies of the phenotype of betaine deficiency in *Zea mays* L. *Plant Physiology* 88: 102-108.

- Lerma, C., Hanson, A.D. and Rhodes, D. 1988. Oxygen-18 and deuterium labeling studies of choline oxidation by spinach and sugar beet. *Plant Physiology* 88: 695-702.
- Rhodes, D. and Handa, S. 1989. Amino acid metabolism in relation to osmotic adjustment. *In* (J.H. Cherry, ed.) "Environmental Stress in Plants. Biochemical and Physiological Mechanisms", NATO ASI Series G: Ecological Sciences, Vol 19, Springer-Verlag, Berlin, pp. 41-62.
- Brouquisse, R., Weigel, P., Rhodes, D., Yocum, C. and Hanson, A.D. 1989. Evidence for a ferredoxin-dependent choline monooxygenase from spinach chloroplast stroma. *Plant Physiology* 90: 322-329.
- Rhodes, D., Rich, P.J. and Brunk, D.G. 1989. Amino acid metabolism of *Lemna minor* L. IV. <sup>15</sup>N-Labeling kinetics of the amide and amino groups of glutamine and asparagine. *Plant Physiology* 89: 1161-1171.
- Weretilnyk, E.A., Bednarek, S., McCue, K.F., Rhodes, D. and Hanson, A.D. 1989. Comparative biochemical and immunological studies of the glycine betaine synthesis pathway in diverse families of dicotyledons. *Planta* 178: 342-352.
- Rhodes, D., Brunk, D.G. and Magalhaes, J.R. 1989. Assimilation of ammonia by glutamate dehydrogenase? *In* (J.E. Poulton, J.T. Romeo, E.E. Conn, eds.) "Plant Nitrogen Metabolism", Recent Advances in Phytochemistry, Vol. 23. Plenum Press, New York, pp. 191-226.
- Rhodes, D., Rich, P.J., Brunk, D.G., Ju, G.C., Rhodes, J.C., Pauly, M.H. and Hansen, L.A. 1989. Development of two isogenic sweet corn hybrids differing for glycinebetaine content. *Plant Physiology* 91: 1112-1121.
- Brunk, D.G., Rich, P.J. and Rhodes, D. 1989. Genotypic variation for glycinebetaine among public inbreds of maize. *Plant Physiology* 91: 1122-1125.
- Rhodes, D. 1990. Fast atom bombardment mass spectrometry. *In* (H.-F. Linskens, J.F. Jackson, eds.) "Modern Methods of Plant Analysis. New Series, Vol. 11. Physical Methods in Plant Science", Springer-Verlag, Berlin, pp. 95-123.
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- Magalhães, J.R., Ju, G.C., Rich, P.J. and Rhodes, D. 1990. Kinetics of <sup>15</sup>NH<sub>4</sub><sup>+</sup> assimilation in *Zea mays* : Preliminary studies with a glutamate dehydrogenase (GDH1) null mutant. *Plant Physiology* 94: 647-656.
- Lerma, C., Rich, P.J., Ju, G.C., Yang, W.-J., Hanson, A.D. and Rhodes, D. 1991. Betaine deficiency in maize: Complementation tests and metabolic basis. *Plant Physiology* 95: 1113-1119.
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- Monyo, E.S., Ejeta, G. and Rhodes, D. 1992. Genotypic variation for glycinebetaine in sorghum and its relationship to agronomic and morphological traits. *Maydica* 37: 283-286.
- Rhodes, D. and Hanson, A.D. 1993. Quaternary ammonium and tertiary sulfonium compounds in higher plants. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* 44: 357-384.
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- Nussbaum, S., von Ballmoos, P., Gfeller, H., Schlunegger, U.P., Fuhrer, J., Rhodes, D. and Brunold, C. 1993. Incorporation of <sup>15</sup>NO<sub>2</sub>-nitrogen into free amino acids by Norway spruce *Picea abies* (L.) Karst. *Oecologia* 94: 408-414.
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- Saneoka, H., Nagasaka, C., Hahn, D.T., Yang, W.-J., Premachandra, G.S., Joly, R.J. and Rhodes, D. 1995. Salt tolerance of glycinebetaine-deficient and -containing maize lines. *Plant Physiology* 107: 631-638.
- Bonham, C.C., Wood, K.V., Yang, W.-J., Nadolska-Orczyk, A., Samaras, Y., Gage, D.A., Poupart, J., Burnet, M., Hanson, A.D. and Rhodes, D. 1995. Identification of quaternary ammonium and tertiary sulfonium compounds by plasma desorption mass spectrometry. *Journal of Mass Spectrometry* 30: 1187-1194.
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- Wood, K.V., Bonham, C.C., Miles, D., Rothwell, A.P., Peel, G., Wood, B.C., Rhodes, D. 2002. Characterization of betaines using electrospray MS/MS. *Phytochemistry* 59: 759-765.
- Rhodes, D., Nadolska-Orczyk, A., Rich, P.J. 2002. Salinity, osmolytes and compatible solutes. *In* (A. Läuchli, U. Lüttge, eds.) "Salinity: Environment - Plants - Molecules", Kluwer Academic, Boston, N.Y., pp. 181-204.
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- Dudareva, N., Andersson, S., Orlova, I., Gatto, N., Reichelt, M., Rhodes, D., Boland, W., Gershenzon, J. 2005. The non-mevalonate pathway supports both monoterpene and sesquiterpene formation in snapdragon flowers. *Proc. Natl. Acad. Sci. U.S.A.* 102: 933-938.
- Kaminaga, Y., Schnepf, J., Peel, G., Kish, C.M., Ben-Nissan, G., Weiss, D., Orlova, I., Lavie, O., Rhodes, D., Wood, K., Porterfield, D.M., Cooper, A.J., Schloss, J.V., Pichersky, E., Vainstein, A., Dudareva,

N. 2006. Plant phenylacetaldehyde synthase is a bifunctional homotetrameric enzyme that catalyzes phenylalanine decarboxylation and oxidation. J. Biol. Chem. 281: 23357-23366.

Orlova, I., Marshall-Colon, A., Schnepf, J., Wood, B., Varbanova, M., Fridman, E., Blakeslee, J.J., Peer, W.A., Murphy, A.S., Rhodes, D., Pichersky, E., Dudareva, N. 2006. Reduction in the synthesis of benzenoids in petunia flowers reveals multiple pathways to benzoic acid and an unexpected enhancement in auxin transport, Plant Cell 18: 3458-3475.

Grants Funded in Last 5 years:

Project Title: **Deciphering the complex metabolic network in snapdragon flowers: an integrative approach.**

Agency: NSF, Molecular and Cellular Bioscience (MCB - BIOMOLECULAR SYSTEMS)

PI's: Natalia Dudareva, John A. Morgan and David Rhodes

Amount awarded: \$1,350,000 (over 60 months)

Start date: 01/01/07

Project Title: **Tablet PC Technology for the Horticulture Curriculum**

Agency: Purdue University Instructional Innovation Computing Funds, College Competition

PI's: Mike Dana, Matthew Jenks, Allen Hammer, David Rhodes, Carl Geiger and Edward Ashworth

Amount awarded: \$41,611 (including matching funds)

Start date: 01/01/06

Project Title: **Benzenoid Network in Petunia and Snapdragon Flowers**

Agency: USDA - NRICGP; Plant Biochemistry 54.3

PI's: Natalia Dudareva and David Rhodes

Amount awarded: \$350,000

Award period: 08/01/05 - 07/31/08

Project Title: **A Proposal To Upgrade Computer Monitors in the Department of Horticulture and Landscape Architecture**

Agency: Purdue University Instructional Computing Fund

PI's: Kim Wilson, Matthew Kirkwood, Allen Hammer, Rob Sovinski, Carl Geiger, Mike Dana, Edward Ashworth and David Rhodes

Project Title: \$20,836

Start date: 01/01/05

Project Title: **Acquisition of metabolic profiling instrumentation at Purdue**

Agency: NSF, Major Research Instrumentation Program (MRI), Instrument Development and Acquisition

PI's: Clint Chapple, David Rhodes, David Salt, Barry Wanner

Amount awarded: \$839,427

Award period: 07/01/04 - 06/30/07

Project Title: **Computational Analysis of Metabolic Pathways (CAMP)**

Agency: Discovery Park, Purdue University; e-Enterprise Center

PI: John A. Morgan (Purdue University)

CoPIs: David Rhodes and Seza Orcun (Purdue University)

Amount funded = \$30,000 over 10 months

Award period: 06/01/03 - 04/01/04

Project Title: **Collaborative Research: Metabolic Engineering of Floral Scent**

Agency: NSF, Division of Bioengineering and Environmental Systems (BES): Biochemical Engineering & Biotechnology (BEB)

PIs: Natalia Dudareva (Purdue University), David Rhodes (Purdue University), and Eran Pichersky (University of Michigan Ann Arbor)

Amount awarded: \$276,664

Award period: 10/01/04 - 09/30/06

Project Title: **Regulation of monoterpene emission in snapdragon flowers**

Agency: NSF, Directorate for Biological Sciences; Division of Molecular and Cellular Biosciences; Cluster for Biomolecular Systems; MCB - Metabolic Biochemistry

PI's: Natalia Dudareva and David Rhodes

Amount funded = \$435,000

Award period: 01/01/03 - 12/31/06

Teaching Involvement (courses taught in the last 5 years):

The following courses are taught yearly; each makes extensive use of WebCT Vista:

- HORT 410 - Vegetable Crops. Spring Semester. This 5 week, 1 credit course takes an intensive look at vegetable crop production practices. Students develop detailed plans for operation of a vegetable farm and are challenged with a series of realistic problems affecting crop production. Typical enrollment = 10 - 12 students per year.
- HORT 603 (formerly 652N) - Grants and Grantsmanship. Spring Semester. This 15 week, 1 credit, graduate level course introduces students to the art and science of grant writing. Various sources of funding and strategies for grant writing are discussed. Students develop their own grant proposal and participate in the peer review of these proposals. Typical enrollment = 14 - 20 students per year.
- HORT 590S – Plant Environmental Stress Physiology. Fall Semester. This 15 week, 2 credit course takes an intensive look at plant adaptations to environmental stresses, such as drought, salinity, high light, high temperature, low temperature and anaerobic stresses. Typical enrollment = 2 - 6 students per year.
- BTNY/HORT 640 - Metabolic Plant Physiology (Rhodes has responsibility for Part C: Nitrogen Metabolism, Sulfur Metabolism and Secondary Metabolism. Natalia Dudareva has responsibility for Part A: Photosynthesis, Respiration, and Lipid Metabolism; and Nick Carpita has responsibility for Part B: Carbohydrate Metabolism and Plant Cell Wall Biosynthesis). Fall Semester. This 15 week, 3 credit, graduate level course takes an intensive look at the metabolic pathways involved in plant primary and secondary metabolism; the enzymes catalyzing the interconversion of metabolic intermediates; the genes encoding these proteins; and the intricate regulation of these metabolic networks. Typical enrollment = 14 - 20 students per year.
- HORT 602 – Horticulture Research Seminar (co-taught with Angus Murphy) [beginning Spring 2007]. Spring and Fall Semester. This 1 credit course (pass/notpass) is required for all Horticulture graduate students starting with their first fall semester in the Horticulture graduate program. Master's and PhD students are required to enroll in the course for a minimum of 3 semesters. PhD students must complete this requirement before taking their preliminary examination. Students attend departmental seminars are write summaries of scientific content and presentation approach. Enrollment in Spring 2007 = 3 students.