

CURRICULUM VITAE

PARK S. NOBEL

Affiliation:

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Biographical: Born 4 November 1938; Chicago, Illinois.

Degrees:

B. Engineering 1961	Cornell University, Ithaca, NY
Physics	National Merit Scholar Alfred P. Sloan Scholar
M.S. Physics	1963 California Institute of Technology, Pasadena, CA National Science Foundation Graduate Fellow Woodrow Wilson Fellow Danforth Fellow
Ph.D. Biophysics	1965 University of California, Berkeley, CA U.S. Public Health Service Biophysics Training Grant National Science Foundation Graduate Fellow

Professional Positions:

National Science Foundation Postdoctoral Fellow, 1965-1966
University of Tokyo, Tokyo, Japan
National Science Foundation Postdoctoral Fellow, 1966-1967
University of London, King's College, London, England
Assistant Professor of Molecular Biology, 1967-1971
Department of Botanical Sciences and Molecular Biology Institute, UCLA
Associate Professor of Biology, 1971-1975
Department of Biology, UCLA
Professor of Biology, 1975-1998
Department of Ecology and Evolutionary Biology, UCLA
Distinguished Professor of Biology, 1998-2004
Department of Ecology and Evolutionary Biology, UCLA
Distinguished Professor of Biology Emeritus, 2004-present
Department of Ecology and Evolutionary Biology, UCLA

Administrative Positions:

Convenor, Division III/IV, Department of Biology, 1975-1976
Vice Chair or Acting Chair, Department of Biology, UCLA, 1979-1983
Assistant Chief, Division of Environmental Biology, Laboratory of
Biomedical and Environmental Sciences, 1978-1983

Chief, Division of Environmental Biology, and Associate Director,
Laboratory of Biomedical and Environmental Sciences, 1989-1996
Chair, Department of Biology-OBEE, 1995-1998
Acting Chair, Department of Organismic Biology, Ecology and Evolution, 2003

Special Awards:

John Simon Guggenheim Foundation Fellowship, 1973-1974, Department
of Environmental Biology, Research School of Biological Sciences,
The Australian National University, Canberra, A.C.T., Australia
Faculty Distinguished Teaching Award, UCLA, 1986

Honor Societies:

Tau Beta Pi
Phi Kappa Phi
Sigma Xi

Professional Societies:

American Association for the Advancement of Science
American Society of Agronomy
American Society of Plant Physiologists
Association for Tropical Biology
Association for Professional Cactus Development
Botanical Society of America
Botanical Society of California
Crop Science Society of America
Ecological Society of America
International Association for Ecology (Intecol)
International Cactus Pear Network
International Organization for Succulent Plant Study
Scandinavian Society for Plant Physiology
Society for Economic Botany

Editorial Responsibilities:

Plant Physiology, editorial board 1975-1979
Plant, Cell and Environment, editorial board 1984-2001
Plants Today, editorial board 1987-1989
Botanical Gazette, editorial board 1990-1991
Journal of Experimental Botany, Associate Editor 1991-1996
International Journal of Plant Science, editorial board 1991-1997
Journal of the Professional Association for Cactus Development, editorial board 2000-

COMMITTEE SERVICE (partial listing and omitting ad hoc committees)

Departmental:

Search or Staffing Committees (1967-2004, fourteen)
Committees on Graduate Courses, Plant Sciences (1967-1971)
Curriculum and Scheduling Committee (1967-1973, 1975-1979)

Fellowship and Teaching Assistantships Committee (1968-1974, 1978-1979, 1981-1982)
Undergraduate Advisor, Botany Department (1969-1974)
Legislative Assembly, Representative (1969-1971, 1975-1977)
Steven A. Vavra Fellowship Committee (1970-2004, rotating chair)
Amalgamation (Botanical Sciences/Zoology) Committee (1971-1972)
Executive Committee or Council (1972-1974, 1975-1976, 1979-1983, 1990-1995)
Graduate Written Examination Committee (1975-1977, 1988-1989)
Lower Division Steering Committee, Courses (1977-1979, 1983-1986)
Computer Committee (1981-1982, 1985-1986)
Departmental Reorganization Committee (1984-1985)
Personnel Committee (1975-1978, 1983-1985, 1987-1988-chair, 1990-1994, 1999-2000)
Space Committee (1984-1986, 1988-1992, 2001, usually chair)
Future Directions Committee (1994-1995)
Teaching Workload Committee (1994-1995)
Curriculum and Scheduling Committee (1999-2002)

Campus:

Molecular Biology Institute Building Committee (1967-1971)
Regents Scholarship Committee (1969-1972)
Molecular Biology Interdepartmental Ph.D. Committee (1969-1973)
Environmental Science and Engineering Steering Committee (1970-1974)
Executive Committee, College of Letters and Science (1971-1972)
Research Committee, Institute of Environmental and Evolutionary Biology
(1973-1978, chair)
Library Committee, Laboratory of Biomedical and Environmental Sciences
(1975-1977, 1988-1993)
Seminar Committee, Laboratory of Nuclear Medicine and Radiation Biology
(1976-1979)
UCLA - Ben Gurion Committee (1979-1982)
Campuswide Capital and Space Planning Committee (1982-1983)
Facilities Division Advisory Committee, College of Letter and Sciences (1982-1986)
Life Sciences Building Renovation Committee (1986-1988)
Life Sciences Master Planning Committee (1989-1993)
Life Sciences Space Committee (1989-1993, 1995-1999)
Division of Life Sciences Dean Review Committee (1991-1992)
Vice Chancellor for Research Search Committee (1991-1992)
Biomedical Sciences Task Force (1993-1994)

Off-Campus:

United Nations Environment Programme Advisory Committee (1980-94)
Botanical Society of America Committee on Graduate Study (1986-88)
President's Advisory Committee for the University of California Statewide Air
Pollution Research Center (1990-1994)
Texas Prickly Pear Council (1990-2003)
Cactus Pear International Network (1992-); member, Board of Directors (representing
Biology)
U.S. Department of Energy Global Change Distinguished Postdoctoral Fellowship

Committee (1991-1995)

Courses Taught Recently:

Biology of Organisms (lower division)

Physicochemical Biology (upper division)

Plant Physiological Ecology (upper division)

Seminar in Biophysical Plant Ecology (graduate)

Graduate Students Supervised:

<u>Name</u>	<u>Degree - Date</u>	<u>Thesis title</u>
Cheng-teh Wang	Ph.D. June 1971	The permeability of pea chloroplasts to alcohols, aldoses, and amino acids
Diane Chang Lin	Ph.D. Sept. 1971	Light-induced chloroplast flattening and changes in magnesium levels as controls of photosynthetic efficiency in <i>Pisum sativum</i>
Marcia M. Miller	Ph.D. June 1972	Light-induced changes in the ultra structure of pea chloroplasts studied in relation to photosynthesis and development
Yuk-Ngai Stephen Cheung	Ph.D. Sept. 1973	Intracellular and intercellular amino acid translocation in <i>Pisum sativum</i>
Donald Austin Lewis	M.A. March 1977	Thermal energy exchange of a barrel cactus, <i>Ferocactus acanthodes</i>
William Kirby Smith	Ph.D. Sept. 1977	The influence of leaf morphology on the ecophysiology of three desert broadleaves (<i>Encelia farinosa</i> Gray, <i>Hyptis emoryi</i> Torr., and <i>Mirabilis tenuiloba</i> Wats.)
Virtue Teruo Ishihara	M.A. Dec. 1982	Passed examination on plant structure and function
Peter William Jordan	Ph.D. June 1983	Seedling establishment and age distributions of desert succulents in relation to rainfall and drought
Wayne Barcikowski	M.A. June 1983	Water relations of cacti during desiccation: distribution of water in tissues
Deborah Orbach Raphael	M.A. June 1985	Influences of parent-ramet connections on growth and survivorship of ramets versus seedlings of <i>Agave deserti</i>
Gary Neil Geller	Ph.D. March 1986	Cactus morphology: Effect on the interception of photosynthetically active radiation and carbon dioxide uptake
Augusto Cesar Franco	Ph.D. March 1989	Modeling plant interactions in deser environments: the effect of neighboring plants on the microhabitat and growth of desert perennials
David Thomas Tissue	Ph.D. Dec. 1989	Physiological integration of parents and ramets of <i>Agave deserti</i> : Carbon relations during vegetative and sexually reproductive growth
Gretchen Barrow North	Ph.D. Dec. 1991	Water uptake and storage in diverse arid-land plants
Michael Edward Loik	Ph.D. June 1992	Cold acclimation, freezing tolerance, and water relations of winter-hardy cacti
Jose Luis Andrade-Torres	Ph.D. Sept 1995	Water relations of terrestrial and epiphytic cacti
Xilian Yue	M.A. Sept 1996	Plant physiological ecology
Eric Alexander Graham	Ph.D. Mar 1999	Effects of heterogeneous soil water, localized salinity, and increased atmospheric carbon dioxide concentration on the physiology of desert succulents
Matthew Joseph Linton	Ph.D. June 1999	Water transport, xylem cavitation, and environmental influences on plant frequency for various arid-land plants
Edward George Bobich	Ph.D. June 2001	Vegetative reproduction as related to the biomechanics and anatomy of stem junctions for opuntia species in

Erick De la Barrera

Southern California

Ph. D. June 2003 Reproductive ecophysiology of cacti, with
emphasis on fruit development and seed germination

PUBLICATIONS

Research Articles and Reviews:

1. Nobel, P.S., and Packer, L. 1964. Energy-dependent ion uptake in spinach chloroplasts. *Biochim. Biophys. Acta* **88**:453-455.
2. Bearden, A.J., Mattern, P.L., and Nobel, P.S. 1964. Mössbauer-effect apparatus for an advanced teaching laboratory. *Amer. J. Physics* **32**:109-119.
3. Beeler, G.W., Fender, D.H., Nobel, P.S., and Evans, C.R. 1964. Perception of pattern and colour in the stabilized retinal image. *Nature* **203**:1200.
4. Packer, L., Siegenthaler, P-A., and Nobel, P.S. 1965. Light-induced high-amplitude swelling of spinach chloroplasts. *Biochem. Biophys. Res. Comm.* **18**:474-477.
5. Nobel, P.S., and Packer, L. 1965. Light-dependent ion translocation in spinach chloroplasts. *Plant Physiol.* **40**:633-640.
6. Packer, L., Siegenthaler, P-A., and Nobel, P.S. 1965. Light-induced volume changes in spinach chloroplasts. *J. Cell Biol.* **26**:593-599.
7. Nobel, P.S., and Mel, H.C. 1966. Electrophoretic studies of light-induced charge in spinach chloroplasts. *Arch. Biochem. Biophys.* **113**:695-702.
8. Packer, L., Nobel, P.S., Gross, E.L., and Mel, H.C. 1966. Fractionation of spinach chloroplasts by flow sedimentation-electrophoresis. *J. Cell Biol.* **28**:443-448.
9. Nobel, P.S., Murakami, S., and Takamiya, A. 1966. Localization of light-induced strontium accumulation in spinach chloroplasts. *Plant Cell Physiol.* **7**:263-275.
10. Nobel, P.S., Murakami, S., and Takamiya, A. 1966. Localization of light-induced barium accumulation in spinach chloroplasts. *Proc. 6th Intl. Congr. Electron Microscopy*, Kyoto, Japan. Pp. 373-374.
11. Nobel, P.S., and Murakami, S. 1967. Electron microscopic evidence for the location and amount of ion accumulation by spinach chloroplasts. *J. Cell Biol.* **32**:209-211.
12. Nobel, P.S. 1967. Relation of swelling and photophosphorylation to light-induced ion uptake by chloroplasts *in vitro*. *Biochim. Biophys. Acta* **131**:127-140.
13. Nobel, P.S. 1967. Calcium uptake, ATPase and photophosphorylation by chloroplasts *in vitro*. *Nature* **214**:875-877.
14. Nobel, P.S. 1967. A rapid technique for isolating chloroplasts with high rates of endogenous photophosphorylation. *Plant Physiol.* **42**:1389-1394.
15. Murakami, S., and Nobel, P.S. 1967. Lipids and light-dependent swelling of isolated spinach chloroplasts. *Plant Cell Physiol.* **8**:657-671.
16. Nobel, P.S. 1968. Chloroplast shrinkage and increased photophosphorylation *in vitro* upon illuminating intact plants of *Pisum sativum*. *Biochim. Biophys. Acta* **153**:170-182.
17. Nobel, P.S. 1968. Light-induced chloroplast shrinkage *in vivo* detectable after rapid isolation of chloroplasts from *Pisum sativum*. *Plant Physiol.* **43**:781-87.
18. Nobel, P.S. 1968. Energetic basis of the light-induced chloroplast shrinkage *in vivo*. *Plant Cell Physiol.* **9**:499-509.
19. Nobel, P.S. 1969. Light-induced changes in the ionic content of chloroplasts in *Pisum sativum*. *Biochim. Biophys. Acta* **172**:134-143.
20. Nobel, P.S., Chang, D.T., Wang, C-t., Smith, S.S., and Barcus, D.E. 1969. Initial ATP formation, NADP reduction, CO₂ fixation, and chloroplast flattening upon illuminating pea leaves. *Plant Physiol.* **44**:655-661.
21. Nobel, P.S. 1969. The Boyle-Van't Hoff relation. *J. Theor. Biol.* **23**:375-379.

22. Nobel, P.S. 1969. Light-dependent potassium uptake by *Pisum sativum* leaf fragments. *Plant Cell Physiol.* **10**:597-605.
23. Nobel, P.S. 1969. Density of pea chloroplasts determined by four different methods. *Biochim. Biophys. Acta* **189**:452-454.
24. Nobel, P.S. 1970. Increased CO₂ fixation by *Pisum sativum* chloroplasts *in vitro* reflecting a change in coupling caused by illuminating the plants. *Plant Cell Physiol.* **11**:380-388.
25. Nobel, P.S., and Wang, C-t. 1970. Amino acid permeability of pea chloroplasts as measured by osmotically determined reflection coefficients. *Biochim. Biophys. Acta* **211**:79-87.
26. Nobel, P.S. 1970. Relation of light-dependent potassium uptake by pea leaf fragments to the P_k of the accompanying organic acid. *Plant Physiol.* **46**: 491-493.
27. Wang, C-t., and Nobel, P.S. 1971. Permeability of pea chloroplasts to alcohols and aldoses as measured by reflection coefficients. *Biochim. Biophys. Acta* **241**:200-212.
28. Lin, D.C., and Nobel, P.S. 1971. Control of photosynthesis by Mg²⁺. *Arch. Biochem. Biophys.* **145**:622-632.
29. Nobel, P.S., and Craig, R.L. 1971. Relative anion permeabilities and concentrations in leaf cells of *Pisum sativum* determined using electrical measurements and the Goldman equation. *Plant Cell Physiol.* **12**:653-656.
30. Miller, M.M., and Nobel, P.S. 1972. Light-induced changes in the ultrastructure of pea chloroplasts *in vivo*. *Plant Physiol.* **49**:535-541.
31. Nobel, P.S., and Cheung, Y.-N.S. 1972. Two amino-acid carriers in pea chloroplasts. *Nature, New Biology* **237**:207-208.
32. Nobel, P.S. 1973. Mitochondrial permeability for alcohols, aldoses, and amino acids. *J. Memb. Biol.* **12**:287-299.
33. Nobel, P.S., and Wang, C-t. 1973. Ozone increases the permeability of isolated pea chloroplasts. *Arch. Biochem. Biophys.* **157**:388-394.
34. Cheung, Y.-N.S., and Nobel, P.S. 1973. Amino acid uptake by pea leaf fragments. *Plant Physiol.* **52**:633-637.
35. Nobel, P.S. 1973. Review: *The Quantitative Analysis of Plant Growth* by C.C. Evans, Univ. of Calif. Press, Berkeley, 1972. *Madroño* **22**:215-216.
36. Nobel, P.S. 1974. Temperature dependence of the permeability of chloroplasts from chilling-sensitive and chilling-resistant plants. *Planta* **115**:369-382.
37. Nobel, P.S. 1974. Ozone effects on chlorophylls *a* and *b*. *Die Naturwissenschaften* **61**:80-81.
38. Nobel, P.S. 1974. Boundary layers of air adjacent to cylinders. Estimation of effective thickness and measurements on plant material. *Plant Physiol.* **54**:177-181.
39. Nobel, P.S. 1974. Free energy in biology. In: N. Calder, ed., *Nature in the Round: A Guide to Environmental Science*, Weidenfeld and Nicolson, London. Pp. 157-167.
40. Nobel, P.S. 1974. Rapid isolation techniques for chloroplasts. In: S. Fleischer and L. Packer, eds., *Methods in Enzymology*, Vol XXXI, Biomembranes, Academic Press, New York. Pp. 600-606.
41. Nobel, P.S. 1975. Chloroplast reflection coefficients: Influence of partition coefficients, carriers, and membrane phase transitions. In: U. Zimmermann and J. Dainty, eds., *Membrane Transport in Plants*, Springer-Verlag, Berlin. Pp. 289-295.
42. Nobel, P.S. 1975. Effective thickness and resistance of the air boundary layer adjacent to spherical plant parts. *J. Exp. Bot.* **26**:120-130.
43. Nobel, P.S., Zaragoza, L.J., and Smith, W.K. 1975. Relation between mesophyll surface area, photosynthetic rate, and illumination level during development for leaves of

- Plectranthus parviflorus* Hanckel. *Plant Physiol.* **55**:1067-1070.
44. Nobel, P.S. 1975. Chloroplasts. In: D.A. Baker and J.L. Hall, eds., *Ion Transport in Plant Cells and Tissues*, Elsevier, Amsterdam. Pp. 101-124.
 45. Nobel, P.S. 1976. Photosynthetic rates of sun versus shade leaves of *Hyptis emoryi* Torr. *Plant Physiol.* **58**:218-223.
 46. Hartsock, T.L., and Nobel, P.S. 1976. Watering converts a CAM plant to daytime CO₂ uptake. *Nature* **262**:574-576.
 47. Nobel, P.S. 1976. Water relations and photosynthesis of a desert CAM plant, *Agave deserti*. *Plant Physiol.* **58**:576-582.
 48. Nobel, P.S. 1976. Review: *Mathematical Models in Plant Physiology* by J.H.M. Thornley, Academic Press, London. *Plant Science Bulletin* **22**:45-46.
 49. Nobel, P.S. 1977. Water relations and photosynthesis of a barrel cactus, *Ferocactus acanthodes*, in the Colorado Desert. *Oecologia* **27**:117-133.
 50. Nobel, P.S. 1977. Water relations of flowering of *Agave deserti*. *Bot. Gaz.* **138**:1-6.
 51. Smith, W.K., and Nobel, P.S. 1977. Temperature and water relations for sun and shade leaves of a desert broadleaf, *Hyptis emoryi*. *J. Exp. Bot.* **28**:169-183.
 52. Nobel, P.S. 1977. Internal leaf area and cellular CO₂ resistance: Photosynthetic implications of variations with growth conditions and plant species. *Physiol. Plant.* **40**:137-144.
 53. Lewis, D.A., and Nobel, P.S. 1977. Thermal energy exchange model and water loss of a barrel cactus, *Ferocactus acanthodes*. *Plant Physiol.* **60**:609-616.
 54. Smith, W.K., and Nobel, P.S. 1977. Influences of seasonal changes in leaf morphology on water-use efficiency for three desert broadleaf shrubs. *Ecology* **58**:1033-1043.
 55. Nobel, P.S. 1978. Microhabitat, water relations, and photosynthesis of a desert fern, *Notholaena parryi*. *Oecologia* **31**:293-309.
 56. Nobel, P.S., and Hartsock, T.L. 1978. Resistance analysis of nocturnal carbon dioxide uptake by a Crassulacean acid metabolism succulent, *Agave deserti*. *Plant Physiol.* **61**:510-514.
 57. Smith, W.K., and Nobel, P.S. 1978. Influence of irradiation, soil water potential, and leaf temperature on leaf morphology of a desert broadleaf, *Encelia farinosa* Gray (Compositae). *Amer. J. Bot.* **65**:429-432.
 58. Nobel, P.S., Longstreth, D.J., and Hartsock, T.L. 1978. Effect of water stress on the temperature optima of net CO₂ exchange for two desert species. *Physiol. Plant.* **44**:97-101.
 59. Nobel, P.S. 1978. Surface temperatures of cacti — Influences of environmental and morphological factors. *Ecology* **59**:986-996.
 60. Nobel, P.S., and Hartsock, T.L. 1979. Environmental influences on open stomates of a Crassulacean acid metabolism plant, *Agave deserti*. *Plant Physiol.* **63**:63-66.
 61. Longstreth, D.J., and Nobel, P.S. 1979. Salinity effects on leaf anatomy. Consequences for photosynthesis. *Plant Physiol.* **63**:700-703.
 62. Jordan, P.W., and Nobel, P.S. 1979. Infrequent establishment of seedlings of *Agave deserti* (Agavaceae) in the northwestern Sonoran Desert. *Amer. J. Bot.* **66**:1079-1084.
 63. Longstreth, D.J., and Nobel, P.S. 1980. Nutrient influences on leaf photosynthesis. *Plant Physiol.* **65**:541-543.
 64. Longstreth, D.J., Hartsock, T.L., and Nobel, P.S. 1980. Mesophyll cell properties for some C₃ and C₄ species with high photosynthetic rates. *Physiol. Plant.* **48**:494-498.
 65. Nobel, P.S. 1980. Leaf anatomy and water-use efficiency. In: N.C. Turner and P.H. Kramer, eds., *Adaptations of Plants to Water and High Temperature Stress*, Wiley, New York. Pp. 43-55.
 66. Nobel, P.S. 1980. Interception of photosynthetically active radiation by cacti of different

- morphology. *Oecologia* **45**:160-166.
67. Nobel, P.S. 1980. Morphology, surface temperatures, and northern limits of columnar cacti in the Sonoran Desert. *Ecology* **61**:1-7.
 68. Nobel, P.S. 1980. Water vapor conductance and CO₂ uptake for leaves of a C₄ desert grass, *Hilaria rigida*. *Ecology* **61**:252-258.
 69. Nobel, P.S. 1980. Morphology, nurse plants, and minimum apical temperatures for young *Carnegiea gigantea*. *Bot. Gaz.* **141**:188-191.
 70. Woodhouse, R.M., Williams, J.G., and Nobel, P.S. 1980. Leaf orientation, radiation interception, and nocturnal acidity increases by the CAM plant *Agave deserti* (Agavaceae). *Amer. J. Bot.* **67**:1179-1185.
 71. Nobel, P.S. 1980. Productivity of selected plant species adapted to arid regions. *Proc. IV Inter. Symp. Alcohols Fuels Technology*, Vol. 1. Guarujá, São Paulo, Brazil. Oct. 5-8, 1980. Pp. 131-138.
 72. Nobel, P.S. 1980. Influences of minimum stem temperatures on ranges of cacti in southwestern United States and central Chile. *Oecologia* **47**:10-15.
 73. Nobel, P.S., and Hartsock, T.L. 1981. Development of leaf thickness for *Plectranthus parviflorus* — Influence of photosynthetically active radiation. *Physiol. Plant.* **51**:163-166.
 74. Nobel, P.S. 1981. Influence of freezing temperatures on a cactus, *Coryphantha vivipara*. *Oecologia* **48**:194-198.
 75. Longstreth, D.J., Hartsock, T.L., and Nobel, P.S. 1981. Light effects on leaf development and photosynthetic capacity of *Hydrocotyle bonariensis* Lam. *Photosynthesis Res.* **2**:95-104.
 76. Jordan, P.W., and Nobel, P.S. 1981. Seedling establishment of *Ferocactus acanthodes* in relation to drought. *Ecology* **62**:901-906.
 77. Nobel, P.S. 1981. Influences of photosynthetically active radiation on cladode orientation, stem tilting, and height of cacti. *Ecology* **62**:982-990.
 78. Lange, O.L., Nobel, P.S., Osmond, C.B., and Ziegler, H. 1981. Introduction: Perspectives in ecological plant physiology. In: O.L. Lange, P.S. Nobel, C.B. Osmond, and H. Ziegler, eds., *Physiological Plant Ecology, Encyclopedia of Plant Physiology, New Series*, Vol. 12A, Springer-Verlag, Berlin. Pp. 1-9.
 79. Nobel, P.S. 1981. Wind as an ecological factor. In: O.L. Lange, P.S. Nobel, C.B. Osmond, and H. Ziegler, eds., *Physiological Plant Ecology, Encyclopedia of Plant Physiology, New Series*, Vol. 12A, Springer-Verlag, Berlin. Pp. 475-500.
 80. Nobel, P.S. 1981. Spacing and transpiration of various sized clumps of a desert grass, *Hilaria rigida*. *J. Ecol.* **69**:735-742.
 81. Nobel, P.S., and Longstreth, D.J. 1981. Effects of environmental factors on leaf anatomy, mesophyll cell conductance, and photosynthesis. In: G. Akoyunoglou, ed., *Photosynthesis VI. Photosynthesis and Productivity, Photosynthesis and Environment*, Balban International Science Services, Philadelphia. Pp. 245-254.
 82. Nobel, P.S., and Hartsock, T.L. 1981. Shifts in the optimal temperature for nocturnal CO₂ uptake caused by changes in growth temperatures for cacti and agaves. *Physiol. Plant.* **51**:163-166.
 83. Nobel, P.S. 1981. Review: *Biophysical Ecology* by D.M. Gates. Springer-Verlag, Berlin. *Amer. Sci.* **69**:459.
 84. Woodhouse, R.M., and Nobel, P.S. 1982. Stipe anatomy, water potentials, and xylem conductances in seven species of ferns (Filicopsida). *Amer. J. Bot.* **69**:135-140.
 85. Didden-Zopfy, B., and Nobel, P.S. 1982. High temperature tolerance and heat

- acclimation of *Opuntia bigelovii*. *Oecologia* **52**:176-180.
86. Nobel, P.S. 1982. Interaction between morphology, PAR interception, and nocturnal acid accumulation in cacti. In: I.P. Ting and M. Gibbs, eds., *Crassulacean Acid Metabolism*, American Society of Plant Physiologists, Rockville, Maryland. Pp. 260-277.
 87. Nobel, P.S. 1982. Orientations of terminal cladodes of platyopuntias. *Bot. Gaz.* **143**:219-224.
 88. Nobel, P.S. 1982. Orientation, PAR interception, and nocturnal acidity increases for terminal cladodes of a widely cultivated cactus, *Opuntia ficus-indica*. *Amer. J. Bot.* **69**:1462-1469.
 89. Nobel, P.S. 1982. Low-temperature tolerance and cold hardening of cacti. *Ecology* **63**:1650-1656.
 90. Jordan, P.W., and Nobel, P.S. 1982. Height distributions of two species of cacti in relation to rainfall, seedling establishment, and growth. *Bot. Gaz.* **143**:511-517.
 91. Nobel, P.S., and Hartsock, T.L. 1983. Relationships between photosynthetically active radiation, nocturnal acid accumulation, and CO₂ uptake for a Crassulacean acid metabolism plant, *Opuntia ficus-indica*. *Plant Physiol.* **71**:71-75.
 92. Nobel, P.S. 1983. Low and high temperature influences on cacti. In: R. Marcelle, H. Clijsters, and M. van Pouke, eds., *Effects of Stress on Photosynthesis*, Proc. Inter. Conf., Limburgs Universitair Centrum, Diepenbek, Belgium, August 22-27, 1982. Pp. 165-174.
 93. Nobel, P.S. 1983. Spine influences on PAR interception, stem temperature, and nocturnal acid accumulation by cacti. *Plant Cell Environ.* **6**:153-159.
 94. Robberecht, R., and Nobel, P.S. 1983. A fibonacci sequence in rib number for a barrel cactus. *Ann. Bot.* **51**:153-155.
 95. Woodhouse, R.M., Williams, J.G., and Nobel, P.S. 1983. Simulation of plant temperature and water loss by the desert succulent, *Agave deserti*. *Oecologia* **57**:291-297.
 96. Acevedo, E., Badilla, I., and Nobel, P.S. 1983. Water relations, diurnal acidity changes, and productivity of a cultivated cactus, *Opuntia ficus-indica*. *Plant Physiol.* **72**:775-780.
 97. Nobel, P.S. 1983. Nutrient levels in cacti — Relation to nocturnal acid accumulation and growth. *Amer. J. Bot.* **70**:1244-1253.
 98. Nobel, P.S., and Jordan, P.W. 1983. Transpiration stream of desert species: Resistances and capacitances for a C₃, a C₄, and a CAM plant. *J. Exp. Bot.* **34**:1379-1391.
 99. Smith, S.D., Hartsock, T.L., and Nobel, P.S. 1983. Ecophysiology of *Yucca brevifolia*, an aborescent monocot of the Mojave Desert. *Oecologia* **60**:10-17.
 100. Robberecht, R., Mahall, B.E., and Nobel, P.S. 1983. Experimental removal of intraspecific competitors — Effects on water relations and productivity of a desert bunchgrass, *Hilaria rigida*. *Oecologia* **60**:21-24.
 101. Nobel, P.S., and Smith, S.D. 1983. High and low temperature tolerances and their relationships to distribution of agaves. *Plant Cell Environ.* **6**:711-719.
 102. Nobel, P.S., and Hartsock, T.L. 1984. Physiological responses of *Opuntia ficus-indica* to growth temperature. *Physiol. Plant.* **60**:98-105.
 103. Nobel, P.S. 1984. PAR and temperature influences on CO₂ uptake by desert CAM plants. Proceedings, IV International Congress on Photosynthesis. *Adv. Photosynthesis Res. IV.* **3**:193-200.
 104. Barcikowski, W., and Nobel, P.S. 1984. Water relations of cacti during desiccation: Distribution of water in tissues. *Bot. Gaz.* **145**:110-115.
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