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CURRICULUM VITAE *(short version)*

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Professional Experience

2008-to date	Research Scientist A+, Institute of Plant Sciences, ARO The Volcani Center, Israel
2013-2014	Sabbatical leave, UC-Davis, California
2009 - 2013	ARO Assistant Director for Regional Agricultural R&D Centers, Israel
1992 - 2008	Research Scientist A, Institute of Horticulture (later named Institute of Plant Sciences), ARO The Volcani Center, Israel
1997 - 2009	Scientific Director, Northern R&D Center (Mop-Zafon), Israel
2009	Sabbatical leave, UC-Davis, California
1993 - 1996	Head, Department of Citriculture, ARO The Volcani Center.
1991 – 1992	Research Scientist (B), Institute of Horticulture, ARO The Volcani Center
1982 - 1991	Senior Scientist, Biochemistry Department, The Weizmann Institute of Science, Rehovot, Israel.
1980 - 1982	Scientist, Biochemistry Department, The Weizmann Institute of Science
1987 - 1988	Sabbatical leave, Biology Department, Brookhaven National Laboratory, Upton, New York, USA
1978 - 1980	Postdoctoral fellow at the Biology Department, Brookhaven National Lab
1974 - 1978	Ph.D., Plant Biochemistry, The Weizmann Institute of Science, Rehovot, Israel
1971 - 1974	M.Sc., Plant Biology, Ben-Gurion University of the Negev
1968 - 1971	B.Sc. in Biology, Ben-Gurion University of the Negev

Areas of Interest and Expertise

- Plant-light interaction: photosynthesis, bioenergetics, photomorphogenesis, photoinhibition, photodamage, sunburns.

- Light-quality manipulation in protected agriculture: Photoselective/light-dispersive netting (colored shade-nets, insect-proof- and hail-nets) for improving the productivity, quality and profitability of ornamental crops, vegetables and fruit trees; Photoselective films; Reflective soil covers**.**
- Netting: Multiple aspects the technology.
- Light and environmental stress (heat, chill, nutrient deficiencies) interplay: physiological and agricultural implications.

Practical applications of our Photoselective Netting technology by growers

LIST OF PUBLICATIONS

A. ARTICLES (in English)

1. **Shahak, Y**., Chipman, D.M. and Shavit, N. (1973). Photophosphorylation studies with fluorescent adenine nucleotide analogs. FEBS Lett. 3: 293-296.
2. **Shahak, Y**., Chipman, D.M. and Shavit, N. (1974). Differential activity of ADP and ATP analogs as substrates for ATP synthesis and the partial reactions of phosphorylation. In: Proc. 3rd International Congress on Photosynthesis. (Avron, M., ed.) pp. 859-866, Elsevier, Amsterdam.
3. **Shahak, Y**., Hardt, H. and Avron (1975). Acid-base driven reverse electron flow in isolated chloroplasts. FEBS Lett. 54: 151-154.
4. **Shahak, Y**., Posner H.B. and Avron, M. (1976). Evidence for a block between platoquinone and cytochrome *f* in a photosynthetic mutant of *Lemna* with abnormal flowering behaviour. Plant Physiol. 57: 577-579.
5. **Shahak, Y**., Pick, U. and Avron, M (1976). Energy dependent reverse electron flow in chloroplasts. In: Enzymes, Electron Transport Systems (Desnuelle, P. and Michelson, A.M., eds.) Vol. 40, pp. 305-314, Elsevier, Amsterdam.
6. **Shahak, Y**., Siderer, Y. and Avron, M. (1977). Reverse electron flow induced luminescence triggered by acid-base transition of chloroplasts. In: Photosynthetic Organelles (Miyachi, S., Katoh, S., Fujita, Y. and Shibata, K., eds.) pp. 115-127, Japanese Society for Plant Physiology, Tokyo.
7. Avron, M., Pick, U., **Shahak, Y**. and Siderer, Y. (1977). Energy conservation by proton transport through chloroplast membranes. In: Structure of Biological Membranes (Abrahamsson, S. and Pascher, I., eds.) pp. 25-30, Plenum Press, New York.
8. **Shahak, Y**., Siderer, Y. and Avron, M. (1977). Acid-base induced reverse electron flow in chloroplasts. In: Bioenergetics of Membranes (Packer, L., Papageorgiou, G.C. and Trebst, A., eds.) pp. 405-414, Elsevier, North Holland.
9. Werber, M.M., **Shahak, Y**. and Avron, M (1980). One site reactivity of Halobacterial 2Fe - ferredoxin as a plant ferredoxin substitute. FEBS Lett. 113: 111-114.
10. Shoshan, V., **Shahak, Y**. and Shavit, N. (1980). Quercetin interaction with the chloroplast ATPase complex. Biochim. Biophys. Acta 591: 421-433.
11. **Shahak, Y**., Crowther, D. and Hind, G. (1980). Endogenous cyclic electron transport in broken chloroplasts. FEBS Lett. 114: 73-78.
12. **Shahak, Y**., Crowther, D. and Hind, G. (1981). The involvement of ferredoxin-$NADP^+$ reductase in cyclic electron transport in chloroplasts. Biochim. Biophys. Acta 636: 234-243.
13. Hind, G., Crowther, D., **Shahak, Y**. and Slovacek, R.E. (1981). The function and mechanism of cyclic electron transport. In: Photosynthesis (Akoyunogleou, G.A., ed.), Vol. II, pp. 87-97, Balaban Int. Sci., Philadelphia.

14. Avron, M., Admon, A. and **Shahak, Y**. (1981). The role of a transmembrane electrical gradient in energy dependent reactions in chloroplasts. In: Energy Coupling in Photosynthesis (Selman, B. R. and Selman-Reimer, S., eds.) pp. 15-23, Elsevier, New York.

15. Farver, O., **Shahak, Y**. and Pecht, I. (1982). Electron uptake and delivery sites on plastocyanin in its reactions with the photosynthetic electron transport system. Biochemistry 21:1885-1890.

16. **Shahak, Y**. (1982). Activation and deactivation of the H^+-ATPase in intact chloroplasts. Plant Physiol. 70: 87-91.

17. Admon, A., **Shahak, Y**. and Avron, M. (1982). Adenosine triphosphate generated electric potential in chloroplasts. Biochim. Biophys. Acta 68l: 405-411.

18. **Shahak , Y**. (1982). The role of Mg^{2+} ions in the light activation process of the H^+-ATPase in intact chloroplasts. FEBS Lett. 145: 223-229.

19. Hurt, E., Hauska, G. and **Shahak, Y**. (1982). Electrogenic proton translocation by the chloroplast cytochrome b_6f complex reconstituted into phospholipid vesicles. FEBS Lett. 149: 211-216.

20. **Shahak, Y**., Admon, A. and Avron, M. (1982). Transmembrane electrical potential formation by chloroplast ATPase complex (CF_0-CF_1) proteoliposomes. FEBS Lett. 150: 27-31.

21. **Shahak, Y**., and Pick, U. (1983). A time lag in the onset of ATP-Pi exchange catalyzed by purified ATP synthase (CF_0-CF_1) proteoliposomes and by chloroplasts. Arch. Biochem. Biophys. 223: 393-406.

22. Hurt, E.C., Gabellini, N., **Shahak, Y**., Lockau, W., and Hauska, G. (1983) Extra proton translocation and membrane potential generation - universal properties of cytochrome bc_1/b_6f complexes reconstituted into liposomes. Arch. Biochem. Biophys. 225: 879-885.

23. **Shahak, Y.** (1984). Regulation of the H^+-ATPase in intact and osmotically shocked chloroplasts. In: Advances in Photosynthesis Research (C. Sybesma, ed.) Vol. II, pp. 6527-6530, M. Nijhoff/W. Junk, The Hague.

24. Belkin, S., Siderer, Y., **Shahak, Y**., Arieli, B. and Padan, E. (1984.) 2, 3-dimercaptopropan-1-ol (BAL): an aerobic electron-transport inhibitor, but an anaerobic photosynthetic electron donor. Biochim. Biophys. Acta 766: 563-569.

25. **Shahak, Y**. (1985). Differential effect of thiol oxidants on the chloroplast H^+-ATPase in the light and in the dark J. Biol. Chem. 260: 1459-1464.

26. **Shahak, Y**. (1986). Regulation of the chloroplast H^+-ATPase by light. The involvement of Mg^{+2} ions. Eur. J. Biochem. 154: 179-185.

27. **Shahak, Y**. and Avron, M. (1986). Reverse electron flow in chloroplasts. Photosynthesis Research 10: 405-413.

28. **Shahak, Y**., Hind, G. and Padan, E. (1987). The site of inhibition of the chloroplast electron transport system by 2,3-dithiopropan-1-*ol* (BAL). Eur. J. Biochem. 164: 453-460.

29. Gal, A., **Shahak, Y**., Schuster, G. and Ohad, I. (1987). Specific loss of LHCII phosphorylation in the *Lemna* mutant 1073 lacking cytochrome *b6f* complex. FEBS Lett. 221: 205-210.

30. **Shahak, Y**., Arieli, B., Binder, B. and Padan, E. (1987). Sulfide-dependent photosynthetic electron flow coupled to proton translocation in thylakoids of the cyanobacterium *Oscillatoria limnetica*. Arch. Biochem. Biophys. 259: 605-615.

31. **Shahak, Y**. (1987). Factors involved in light-activation of the chloroplast H^+-ATPase. In: Progress in Photosynthesis Research (Biggins, J., ed.) Vol. 3, pp. 141-144, M. Nijhoff Publishers, Dordrecht.

32. Karlish, S.J.D., Goldschleger, R., **Shahak, Y**. and Rephaeli, A. (1988). Charge transfer by the Na/K pump. In: The Na^+, K^+-Pump. Part A: Molecular Aspects (Skou, J.C., Norby, J.G., Maunsbach, A.B. and Esmann, M., eds.) pp. 519-524, Allan R. Liss, Inc., New York.

33. Arieli, B, Binder, B., **Shahak, Y**. and Padan, E. (1989). Sulfide induces the synthesis of a periplasmic protein in the cyanobacterium *Oscillatoria limnetica*. J. Bacteriol. 171: 699-702.

34. Goldschleger, R., **Shahak, Y**. and Karlish, S.J.D. (1990). Electrogenic and electro-neutral transport modes of renal Na/K ATPase reconstituted into phospholipid vesicles. J. Membrane Biol. 113: 139-154.

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39. **Shahak, Y**., Arieli, B., Hauska, G., Herrmann, I. and Padan, E. (1993). Isolation of sulfide-quinone reductase (SQR) from prokaryotes. Phyton 32: 131-135.

40. **Shahak, Y**., Klughammer, C., Schreiber, U., Padan, E., Herrmann, I. and Hauska, G. (1994). Sulfide-quinone and sulfide-cytochrome reduction in *Rhodobacter capsulatus.* Photosynthesis Research 39: 175-181.

41. Arieli, B., **Shahak, Y**., Taglicht, D., Hauska, G. and Padan, E. (1994) Purification and characterization of sulfide-quinone reductase (SQR), a novel enzyme driving anoxygenic photosynthesis in *Oscillatoria limnetica.* J. Biol. Chem. 269: 5705-5711.

42. Klughammer, C., Hager, C., Padan, E., Schütz, M., Schreiber, U., **Shahak, Y.** and Hauska, G. (1995). Reduction of cytochromes with menaquinol and sulfide in membranes from green sulfur bacteria. Photosynth. Res. 43: 27-34.

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44. Gussakovsky, E.E., **Shahak, Y.**, Sadowsky, A., Rottman, N., and Hertzano, Y. (1997) A direct light penetration model for optimal plantation design of citrus orchards. Proc. Int. Soc. Citriculture (Manicom, B., Robinson, J., du Plessis, S.F., Joubert, P., van Zyl, J.L. and du Preez, S., eds) Dynamic Ad, Vol 2, pp 767-771.

45. Nir, G., Ratner, K., Gussakovsky, E.E. and **Shahak, Y.** (1997) Photoinhibition of photosynthesis in mango leaves: effect of chilly nights. Acta Horticulturae, 455(1): 228-235.

46. Gussakovsky, E. E., Barzda, V., **Shahak, Y.** and Garab, G. (1997) Irreversible disassembly of chiral microdomains in spinach thylakoids due to photoinhibition. Photosynth. Res., 51: 119-126.

47. Schütz, M., **Shahak, Y.**, Padan, E. and Hauska, G. (1997) Sulfide-quinone reductase from *Rhodobacter capsulatus*: purification, cloning and expression J. Biol. Chem., 272: 9884-9890.

48. Zilkah, S., David, I., Yeselson, Y., Moreshet, S., Gussakovsky, E.E. Ratner, K. and **Shahak, Y**. (1998) Advanced maturity and improved size of 'Burlat' and 'Chinook' sweet cherry fruits under UV-absorbing plastic. Proc. Int. Congr. for Plastics in Agriculture, Tel-Aviv, Israel (S. Ben-Yehoshua, ed.) CIPA Proceedings, pp. 320-324.

49. Schütz, M., Grieshabeck, C., Bronstein, M., Meldner, I., **Shahak, Y**., Padan, E. and Hauska, G. (1998) Sulfide-quinone reductase (SQR) of *Rhodobacter capsulatus* : expression, induction and inactivation. In: Photosynthesis: Mechanisms and Effects (Garab G., ed.) Vol. III pp. 1919-1922, Kluwer Academic Publishers, The Netherlands.

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51. Dai, N., Schaffer, A., Petreikov, M., **Shahak, Y**., Levine, A., Giller, Yu., Ratner, K. and Granot, D. (1999) Overexpression of *Arabidopsis* hexokinase in tomato plants inhibits growth, reduces photosynthesis and induces rapid senescence. Plant Cell, 11: 1253-1266.

52. Gussakovsky, E.E. and **Shahak, Y**. (1999) Computational model for direct solar irradiation of canopy in dense orchard. Proc. 5th Intern. Symp. Computer Modelling of Fruit Research and Orchard Management, Wageningen, Holland. Acta Hortic. 499: 289-296.

53. Bronstein, M., Schütz, Hauska, G., Padan, E. and **Shahak, Y**. (2000) Cyanobacterial sulfide-quinone-reductase (SQR): cloning and heterologous expression. J. Bacteriol. 182: 3336-3344.

54. Allen, D.J., Ratner, K., Giller, E.Y., Gussakovsky, E.E., **Shahak, Y**. and Ort, D.R. (2000) An overnight chill induces a delayed inhibition of photosynthesis at midday in mango (*Mangifera indica* L.) J. Exp.Bot., 51: 1893-1902.

55. Gussakovsky, E.E., **Shahak, Y**., van Amerongen, H and Barzda, V. (2001) Circular polarized luminescence reflects the macroorganization of grana in pea chloroplasts Photosynthesis Research, 65: 83-92.

56. Oren-Shamir, M., Gussakovsky, E.E., Shpiegel, E., Nissim-Levi, A.,Ratner, K., Ovadia, R., Giller, Yu.E. and **Shahak, Y** (2001) Coloured shade nets can improve the yield and quality of green decorative branches of *Pittosporum variegatum* J. Hort. Sci. Biotech., 76: 353-361.

57. Michaeli, R., Philosoph-Hadas, S., Riov, J., **Shahak, Y.**, Ratner, K. and Meir, S. (2001) Chilling-induced leaf abscission of *Ixora coccinea* plants: III. Enhancement by high light via increased oxidative processes. Physiol. Plantarum, 113 (3): 338-345.

58. Gussakovsky, E.E., B Salakhutdinov B. and **Shahak, Y**. (2001) Monitoring chiral macroaggregates of LHCII: From isolated chloroplasts to green leaves. PS 2001. Proc. 12th International Congress on Photosynthesis (Critchley, C., ed.), S31-007, pp. 1-5, CSIRO Publishing, Brisbane, Australia.

59. Gussakovsky, E.E., B Salakhutdinov B. and **Shahak, Y**. (2002) Chiral macroaggregates of LHCII detected by circularly polarized luminescence (CPL) in intact pea leaves are sensitive to drought stress. Functional Plant Biology 29: 957-965.

60. Aharon, R., **Shahak, Y**., Wininges, S., Bendov, R., Kapulnik, Y., and Galili, G. (2003) Overexpression of a plasma membrane aquaporin in transgenic tobacco improves plant vigor under favorable growth conditions, but not under drought or salt stress. Plant Cell, 15: 439-447.

61. German, M., Dai, N., Matsevitz, T., Hanael, R., Petreikov, M., Bernstein, N., Ioffe, M., **Shahak, Y**., Schaffer, A.A. and Granot, D. (2003) Suppression of fructokinase encoded by lefrk2 in tomato stem inhibits growth and causes wilting of young leaves The Plant J., 34: 837-846.

62. Barzda, V., Maksim, I., van Amerongen, H., Gussakovsky, E.E. and **Shahak, Y**. (2004) Effect of chloroplast alignment and excitation wavelength on circularly polarized chlorophyll luminescence. J. Fluorescence, 14: 207-216

63. **Shahak, Y**., Gussakovsky, E.E., Cohen, Y., Lurie, S., Stern, R., Kfir, S., Naor, A. Atzmon, I., Doron, I., and Greenblat-Avron, Y. (2004) ColorNets: a new approach for light manipulation in fruit trees. Proc. XXVI International Hort. Congress - Deciduous Fruit and Nut Trees (Webster, A.D., ed.) Acta Hortic. 636: 609-616 .

64. Gussakovsky E. E., Ionov, M.V., Giller, Yu.E., Ratner, K., Aripov, T.F. and **Shahak, Y.** (2004) Left- and right-handed LHCII macroaggregates revealed by circularly polarized luminescence. Photosynth. Res. 87: 253-265.

65. **Shahak, Y**., Gussakovsky, E.E., Gal E. and Ganelevin R. (2004) ColorNets: crop protection and light-quality manipulation in one technology. Proc. 7th International Symposium on Protected Cultivation in Mild Winter Climates:

Production, Pest Management and Global Competition (Cantliffe, D.J., Stoffela, P.J. and Shaw, N.L. eds.) Acta Hortic. 659 (1): 143-151.

66. Gussakovsky, E.E. and **Shahak, Y**. (2004) LHCII chiral macroaggregates in intact leaves and isolated chloroplasts. The CPL studies. Photosynthesis: Fundamental Aspects to Global Perspectives. Proc. 13th Intern. Congress on Photosynthesis (van der Est, A. and Bruce, D., eds) Vol. 1 paper 153, International Society of Photosynthesis.

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70. **Shahak, Y**. (2008) Photo-selective netting for improved performance of horticultural crops. A review of ornamental and vegetable studies in Israel. In: Proc. 27th IHC - Cultiv. Asian, Sub-trop., Underutilized Hort. Crops (D-G Oh and C. Kubota, Eds.-in-Chief). Acta Hortic., 770: 161-168.

71. Basile, B., Romano, R., Giaccone, M., Barlotti, E., Colonna, V., Cirillo, C., **Shahak, Y**. and M. Forlani (2008) Use of Photo-Selective Nets for Hail Protection of Kiwifruit Vines in Southern Italy. In: Proc. 27th IHC - Cultiv. Asian, Sub-trop., Underutilized Hort. Crops (D-G Oh and C. Kubota, Eds.-in-Chief). Acta Hortic., 770:185-192.

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73. **Shahak, Y**., Gal, E., Offir, Y. and Ben-Yakir, D. (2008) Photoselective shade netting integrated with greenhouse technologies for improved performance of vegetable and ornamental crops. In: International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions (C. Kubota and M. Kacira, eds.) Acta Hortic. 797: 75-80.

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76. Fallik. E., Alakali-Tuvia, S., Parselan, Y., Aharon, Z., Elmann, A., Offir, Y., Matan, E., Yehezkel, H., Ratner, K., Zur, N. and **Shahak, Y**. (2009) Can colored shade nets maintain sweet pepper quality during storage and marketing? In: Proc. IVth Balkan Symp. On Vegetables and Potatoes (L. Krasteva and N. Panayotov, eds.) Acta Hortic. 830: 37-43.

77. Goren, A., Alkalai_Tuvia, S., Perzelan, Y., Aharon, Z., Fallik, E. and **Shahak, Y**. (2010) The effect of colored shade nets on sweet bell pepper quality after prolonged storage and shelf life. In: Proc. 28th IHC – IS on Greenhouse and Soiless Cultivation (N. Castilla, ed.), Acta Hortic. 927: 565-570.

78. Kong, Y., Avraham, L., Ratner, K. and **Shahak, Y**. (2012) Response of Photosynthetic Parameters of Sweet Pepper Leaves to Light Quality Manipulation by Photoselective Shade Nets. In: Proc. 7th International Symposium on Light in Horticultural Systems (S. Hemming and E. Heuvelink, eds.), Acta Hortic. 501-506.

79. Ben-Yakir, D., Antignus, Y., Offir, Y. and **Shahak, Y**. (2012) Optical manipulation of insect pests for protecting agricultural crops. In: Proc. 7th International Symposium on Light in Horticultural Systems (S. Hemming and E. Heuvelink, eds.), Acta Hortic. 609-616.

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81. Basile B., Giaccone M., Cirillo C., Ritieni A., Graziani G., **Shahak Y**. and Forlani M. (2012) Photo-selective hail nets affect fruit size and quality in Hayward kiwifruit. Scientia. Hortic. 141: 91-97.

82. Kong, Y. Avraham, L., Perzelan, Y., Alkalai-Tuvia, S., Ratner, K., **Shahak, Y**. and Fallik, E. (2013) Pearl netting affects postharvest fruit quality in 'Vergasa' sweet pepper via light environment manipulation Scientia Hortic. 150: 290-298.

83. Tanny, J., Pirkner, M., Teitel, M., Cohen, S., **Shahak, Y**., Shapira, O. and Israeli, Y. (2014) The effect of screen texture on air flow and radiation transmittance: laboratory and field experiments. In: Proc. International CIPA Conference 2012 on Plasticulture for a Green Planet (A. Sadka, ed.). Acta Hortic. (ISHS) 1015: 45-51.

84. Ben-Yakir, D., Antignus, Y., Offir, Y. and **Shahak, Y**. (2014) Photoselective nets and screens can reduce insect pests and diseases in agricultural crops. In: Proc. International CIPA Conference 2012 on Plasticulture for a Green Planet (A. Sadka, ed.). Acta Hortic. (ISHS) 1015: 95-102.

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86. Wachsmann, Y., Zur, N., **Shahak, Y**., Ratner, K., Giler, Y., Schlizerman, L., Sadka, A., Cohen, S., Garbinshikof, V., Giladi, B. and Faintzak, M. (2014). Photoselective anti-hail netting for improved citrus productivity and quality. In: Proc. International CIPA Conference 2012 on Plasticulture for a Green Planet (A. Sadka, ed.). Acta Hortic. (ISHS) 1015: 169-176.

87. Basile B., Giaccone M., **Shahak Y.**, Forlani M., Cirillo C. (2014) Regulation of the vegetative growth of kiwifruit vines by photo-selective anti-hail netting. Scientia Hortic. 172: 300-307.

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90. Naschitz, S., Naor, A., Sax, Y., **Shahak, Y.** and Rabinowitch, H. (2015) Photo-oxidative sunscald of apple: effects of temperature and light on fruit peel photoinhibition, bleaching and short-term tolerance acquisition. Scientia Hortic. 197: 5-16.

91. Kong, Y., Ratner, K., Avraham, L. and **Shahak, Y**. (2015) Pearl Netting Improves Photosynthetic Light Use Associated with Modification of Structural and Physiochemical Traits of Sweet Pepper Leaves. In: Proc. International Symposium on New Technologies and Management of Greenhouses (F. Baptista and L.L. Silva, eds.) Acta Hortic., in press.

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B. REVIEW ARTICLES AND BOOK CHAPTERS

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E. PATENTS

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