

## CURRICULUM VITAE

**NAME:** NATHAN NELSON

**DATE OF BIRTH:** January 1, 1938

**PLACE OF BIRTH:** Avihail, ISRAEL

**MARITAL STATUS:** Married with three children

**CITIZENSHIP:** Israeli citizen

### EDUCATION:

1965	B.Sc. Biology, Tel-Aviv University, Israel
1966	M.Sc. Plant Physiology, Tel-Aviv University, Israel
1970	Ph.D. Plant Biochemistry, Tel-Aviv University, Israel

### BRIEF CHRONOLOGY OF EMPLOYMENT:

1970-1972	Postdoctoral Fellow, Biochemistry, Cornell Univ., Ithaca, NY, with Prof. E. Racker.
1972-1977	Senior Lecturer, Dept. Biology, Technion, Haifa, Israel.
1977-1980	Associate Professor, Technion, Haifa, Israel.
1978-1979	Visiting Professor, Biocenter, University of Basel.
1980-1985	Professor, Dept. Biology, Technion, Haifa, Israel.
1983-1984	Visiting Professor, Section of Biochemistry, Cornell University, Ithaca, NY.
1985-1986	Full Member, Department of Biochemistry, Roche Institute of Molecular Biology, Nutley, NJ.
1986-1992	Laboratory Head, Department of Biochemistry, Roche Institute of Molecular Biology, Nutley, NJ.
1992-1995	Full Member II, Roche Institute of Molecular Biology, Nutley, NJ.
1995- 2006	Professor, Dept. Biochemistry, Tel Aviv University, Israel.
2006-	Prof. Emeritus, Biochemistry, Tel Aviv University, Israel.

### Summers of:

1973 and 1977	Visiting Professor, Section of Biochemistry, Cornell University, Ithaca, NY.
1979	Visiting Professor, Dept. Physics, UCSD, La Jolla, CA.
1980, 81 and 82	Visiting Professor, Biocenter, University of Basel.

### RESEARCH INTERESTS:

Membrane biotechnology; structure and function of biological membranes; photosynthesis; bioenergetics; metal-ion transporters; neurotransmitter transporters; structure and function of proton-ATPase complexes; molecular biology of V-ATPase; structure and function of Photosystem I reaction centers and other chloroplast complexes; biogenesis and assembly of protein complexes in membranes; Bioenergetics. Sustainable and clean energy production by biological systems.

**EDITORIAL BOARDS:**

The Plant Journal  
J. of Bioenergetics and Biomembranes  
Editorial Board of F1000 Research  
Frontiers Plant Sciences

**AWARDS:**

1992 Humboldt Award  
1997 Elected EMBO member  
2000 Cathedra “Function of Membrane Transporters”  
2006 Honorary professorship – Sichuan University  
2007 Honorary Doctor – University of Bologna  
2011 ILANIT-Katzir prize of the Federation of Israel Societies of Experimental Biology (FISEB)  
2012 Awarded 5 years advanced ERC grant  
2013 Israel Prize of Life Sciences

**ACTIVITIES:**

2000- 2002 Member of the Board of Governors – Tel Aviv University  
1998-2001 Vice Chairman of the International Advisory Board at the International Institute of Molecular and Cell Biology in Warsaw  
2002-2004 Member of the Executive Council – Tel Aviv University  
2002-2005 President of the Israel Society for Biochemistry and Molecular Biology  
2005-2011 Director of the Daniella Rich Institute for Structural Biology

**SOCIETIES:**

American Association for the Advancement of Science  
American Society for Biochemistry and Molecular Biology  
Biophysical Society  
Federation of American Societies for Experimental Biology  
International Society for Plant Molecular Biology  
International Society for Neurochemistry  
Israel Society for Biochemistry and Molecular Biology  
European Molecular Biology Organization

## PUBLICATIONS:

Papers (more than 15,000 citations)

1. Nelson, N. and Neumann, J. (1968) Interaction between ferredoxin and ferredoxin-NADP reductase from chloroplasts. **Biophys. Res. Commun.** *30*, 142-147.
2. Nelson, N. and Neumann, J. (1969) Interaction between ferredoxin and ferredoxin-NADP reductase in pyridine nucleotide photoreduction and some partial reactions. I. Inhibition of ferredoxin-NADP reductase by ferredoxin. **J. Biol. Chem.** *244*, 1926-1931.
3. Nelson, N. and Neumann, J. (1969) Interaction between ferredoxin and ferredoxin-NADP reductase in pyridine nucleotide photoreduction and some partial reactions. II. Complex formation between ferredoxin and ferredoxin-NADP reductase and its relevance to pyridine nucleotide photoreduction. **J. Biol. Chem.** *244*, 1932-1936.
4. Nelson, N. and Ilan, I. (1969) Inhibition of nitrate reductase from tomato leaves by adenosine-5'-diphosphate. **Plant and Cell Physiol.** *10*, 143.
5. Drechsler, Z., Nelson, N. and Neumann, J. (1969) Antimycin A as an uncoupler and electron transport inhibitor in photoreactions of chloroplasts. **Biochim. Biophys. Acta** *189*, 65.
6. Nelson, N., Drechsler, Z. and Neumann, J. (1970) Photophosphorylation in digitonin subchloroplast particles. Absence of a light-induced pH shift. **J. Biol. Chem.** *245*, 143.
7. Cammack, R., Neumann, J., Nelson, N. and Hall, D.O. (1971) Circular dichroism studies of the complex between ferredoxin-NADP reductase. **Biochem. Biophys. Res. Commun.** *42*, 292.
8. Nelson, N., Nelson, H., Naim, Y. and Neumann, J. (1971) Effect of pyridine on the light-induced pH rise and postillumination ATP synthesis in chloroplasts. **Arch. Biochem. Biophys.** *145*, 263.
9. Nelson, N. and Neumann, J. (1972) Isolation of a cytochrome b<sub>6</sub>-f particle from chloroplasts. **J. Biol. Chem.** *247*, 1817-1824.
10. Nelson, N. and Racker, E. (1972) Partial resolution of the enzymes catalyzing photophosphorylation. X. Purification of spinach cytochrome f and its photooxidation by resolved photosystem I particles. **J. Biol. Chem.** *247*, 3848-3853.
11. Nelson, N., Nelson, H. and Racker, E. (1972) Partial resolution of the enzymes catalyzing photophosphorylation. XI. Magnesium-ATPase properties of heat activated coupling factor I from chloroplasts. **J. Biol. Chem.** *247*, 6506.

12. Nelson, N., Nelson, H. and Racker, E. (1972) Partial resolution of the enzymes catalyzing photophosphorylation. XII. Purification and properties of an inhibitor isolated from chloroplast coupling factor I. **J. Biol. Chem.** 247, 7657-7662.
13. Nelson, N. (1972) Differential effects of DCMU on the light-induced absorbance changes at 518 nm, H<sup>+</sup>-uptake and cyclic photophosphorylation in isolated chloroplasts. **FEBS Lett.** 24, 57.
14. Nelson, N., Nelson, H. and Racker, E. (1972) Photoreaction of FMN-Tricine and its participation in photophosphorylation. **Photochem. Photobiol.** 16, 481-489.
15. Nelson, N., Deters, D.W., Nelson, H. and Racker, E. (1973) Partial resolution of the enzymes catalyzing photophosphorylation. XIII. Properties of isolated subunits of coupling factor I from spinach chloroplasts. **J. Biol. Chem.** 248, 2049-2055.
16. Nelson, N. and Racker, E. (1973) Phosphate transfer from adenosine triphosphate in a model system. **Biochemistry** 12, 563.
17. Nelson, N., Kanner, B.J. and Gutnick, D.L. (1974) Purification and properties of Mg<sup>++</sup>-Ca<sup>++</sup> ATPase from *Escherichia coli*. **Proc. Natl. Acad. Sci. USA** 71, 2720.
18. Deters, D.W., Racker, E., Nelson, N. and Nelson, H. (1975) Partial resolution of the enzymes catalyzing photophosphorylation. XV. Approaches to the active site of coupling factor I. **J. Biol. Chem.** 250, 1041.
19. Kamienietzky, A. and Nelson, N. (1975) Preparation and properties of chloroplasts depleted of CF<sub>1</sub> by sodium bromide treatment. **Plant Physiol.** 55, 282-287.
20. Bengis, C. and Nelson, N. (1975) Purification and properties of the photosystem I reaction center from chloroplasts. **J. Biol. Chem.** 250, 2783-2788.
21. Lewis, A., Nelson, N. and Racker, E. (1975) Laser raman spectroscopy as a mechanistic probe of phosphate transfer from adenosine triphosphate in a model system. **Biochemistry** 14, 1532.
22. Kanner, B.I., Nelson, N. and Gutnick, D.L. (1975) Differentiation between *UncB* mutants in *Escherichia coli* K<sub>12</sub>. **Biochim. Biophys. Acta** 396, 347.
23. Nelson, N., Bengis, C., Silver, B.L., Getz, D. and Evans, M.G.W. (1975) Electron spin resonance studies of bound ferredoxin in chloroplast photosystem I reaction center. **FEBS Lett.** 58, 363-365.
24. Yocum, C.F., Nelson, N. and Racker, E. (1975) A combined procedure for preparation of plastocyanin, ferredoxin and CF<sub>1</sub>. **Preparative Biochemistry** 5, 305.

25. Nelson, N. and Broza, R. (1976) Salt inactivation as a mechanistic probe of membrane bound chloroplast coupling factor I. **Eur. J. Biochem.** 69, 203-208.
26. Nelson, N. and Karny, O. (1976) The role of delta subunit in the coupling activity of chloroplast coupling factor I. **FEBS Lett.** 70, 249-253.
27. Nelson, N. (1976) Structure and function of chloroplast ATPase (a review). **Biochim. Biophys. Acta** 456, 314-338.
28. Nelson, N., Eytan, E., Notsani, B., Sigrist, H., Sigrist-Nelson, K. and Gitler, C. (1977) Isolation of a chloroplast N,N'-dicyclohexylcarbodiimide-binding proteolipid, active in proton translocation. **Proc. Natl. Acad. Sci. USA** 74, 2375.
29. Bengis, C. and Nelson, N. (1977) Subunit structure of chloroplast photosystem I reaction center. **J. Biol. Chem.** 252, 4564-4569.
30. Junge, W., Schaffernicht, H. and Nelson, N. (1977) On the mutual orientation of pigments in photosystem I particles of green plants. **Biochim. Biophys. Acta** 462, 73-85.
31. Gepshtein, A., Carmeli, C. and Nelson, N. (1978) Purification and properties of adenosine triphosphatase from chromatium vinosum chromatophores. **FEBS Lett.** 85, 219.
32. Ralt, D., Nelson, N. and Gutnick, D. (1978) Specific immunoprecipitation of ATPase from *Escherichia coli*. **FEBS Lett.** 91, 85.
33. Nelson, N., Chibovsky, R. and Gutnick, D.L. (1979) ATP-Pi exchange preparation from *Escherichia coli*. **Methods. Enzymol.** 55, 358.
34. Nelson, N. and Schatz, G. (1979) Energy dependent processing of cytoplasmically-made precursors to mitochondrial proteins. **Proc. Natl. Acad. Sci. USA** 76, 4365.
35. Nelson, N. (1979) Coupling factors from higher plants. **Methods Enzymol.** 69, 301-313.
36. Moran, A., Tal, E., Eytan, E. and Nelson, N. (1980) Study of proton pumps by phospholipid impregnated Millipore filters. **FEBS Lett.** 110, 62-64.
37. Nelson, N., Nelson, H. and Schatz, G. (1980) Biosynthesis and assembly of the proton-translocating adenosine triphosphatase complex from chloroplasts. **Proc. Natl. Acad. Sci. USA** 77, 1361-1364.
38. Nelson, N., Anholt, R., Lindstrom, J. and Montal, M. (1980) Reconstitution of purified acetylcholine receptors with functional ion channels in planar bilayers. **Proc. Natl. Acad. Sci. USA** 77, 3057-3061.

39. Lewin, A.S., Gregor, I., Mason, T.L., Nelson, N. and Schatz, G. (1980) The cytoplasmically-made subunits of yeast mitochondrial F<sub>1</sub>-ATPase and cytochrome c oxidase are synthesized as individual precursors, not as polyproteins. **Proc. Natl. Acad. Sci. USA** 77, 3998-4002.
40. Nelson, N. (1980) Proton channels in chloroplast membranes. **Ann. NY Acad. Sci.** 358, 25-36.
41. Hauska, G., Samoray, D., Orlich, G. and Nelson, N. (1980) Reconstitution of photosynthetic energy conservation. **Eur. J. Biochem.** 111, 535-543.
42. Alfonzo, A., Nelson, N. and Racker, E. (1980) A light-dependent protein kinase activity of chloroplasts. **Plant Physiol.** 65, 730-734.
43. Nechushtai, R., Nelson, N., Mattoo, A.K. and Edelman, M. (1981) Site of synthesis of subunits to photosystem I reaction center and the proton-ATPase in spirodela. **FEBS. Lett.** 125, 115-119.
44. Rott, R. and Nelson, N. (1981) Purification and immunological properties of proton-ATPase complexes from yeast and rat liver mitochondria. **J. Biol. Chem.** 256, 9224-9228.
45. Nechushtai, R. and Nelson, N. (1981) Photosystem I reaction centers from chlamydomonas and higher plant chloroplasts. **J. Bioenerg. Biomemb.** 13, 295-306.
46. Nechushtai, R. and Nelson, N. (1981) Purification properties and biogenesis of chlamydomonas photosystem I reaction center. **J. Biol. Chem.** 256, 11624-11628.
47. Nelson, N. (1981) Proton ATPase of chloroplasts. **Curr. Topics Bioenergetics** 11, 1-33.
48. Westhoff, P., Nelson, N., Bünemann, H. and Herrmann, R.G. (1981) Localization of genes for coupling factor subunits on the spinach plastid chromosome. **Curr. Gen.** 4, 109-120.
49. Schindler, H. and Nelson, N. (1982) Proteolipid of adenosine triphosphatase from yeast mitochondrial forms proton selective channels in planar lipid bilayers. **Biochemistry** 21, 5787-5794.
50. Cidon, S. and Nelson, N. (1982) Properties of a novel ATPase enzyme in chromaffin granules. **J. Biomem. Bioenerg.** 14, 499-512.
51. Nelson, N. (1983) Structure and synthesis of chloroplast ATPase. **Methods Enzymol.** 97, 510-523.

52. Nechushtai, R., Muster, P., Binder, A., Liveanu, V. and Nelson, N. (1983) Photosystem I reaction center from the thermophilic cyanobacterium *Mastigocladus laminosus*. **Proc. Natl. Acad. Sci. USA** *80*, 1179-1183.
53. Cidon, S. and Nelson, N. (1983) A novel ATPase in the chromaffin-granule membrane. **J. Biol. Chem.** *258*, 2892-2896.
54. Alt, J., Westhoff, P., Sears, B.B., Nelson, N., Hurt, E., Hauska, G. and Herrmann, R.G. (1983) Genes and transcripts of the polypeptides of the cytochrome b6/f complex from spinach thylakoid membranes. **EMBO Journal** *2*, 979-986.
55. Westhoff, P., Alt, J., Nelson, N., Bottomley, W., Bünemann, H. and Herrmann, R.G. (1983) Genes and transcripts for the P700 chlorophyll *a* apoprotein and subunit 2 of the photosystem I reaction center complex from spinach thylakoid membranes. **J. Plant Mol. Biol.** *2*, 95-107.
56. Cidon, S., Ben-David, H. and Nelson, N. (1983) ATP driven proton fluxes across membranes of secretory organelles. **J. Biol. Chem.** *258*, 11684-11688.
57. Riezman, H., Hay, R., Witte, C., Nelson, N. and Schatz, G. (1983) Yeast mitochondrial outer membrane specifically binds cytoplasmically-synthesized precursors of mitochondrial proteins. **EMBO Journal** *2*, 1113-1118.
58. Ben-David, H., Nelson, N. and Gepstein, S. (1983) Differential changes in the amount of protein complexes in the chloroplast membrane during senescence of oat and bean leaves. **Plant Physiol.** *73*, 507-510.
59. Nelson, N. and Cidon, S. (1984) New molecular aspects of energy transducing protein complexes. **J. Bioenerg. Biomembr.** *16*, 11-36.
60. Lyons, S. and Nelson, N. (1984) An immunological method for detecting gene expression in yeast colonies. **Proc. Natl. Acad. Sci. USA** *81*, 7426-7430.
61. Nechushtai, R., Nelson, N., Gonen, O. and Levanon, H. (1985) Photosystem I reaction center from *Mastigocladus laminosus* correlation between reduction state of the iron-sulfur centers and the triplet formation mechanisms. **Biochim. Biophys. Acta** *807*, 35-43.
62. Nechushtai, R. and Nelson, N. (1985) Biogenesis of photosystem I reaction center during greening. **Plant Mol. Biol.** *4*, 377-384.
63. Westhoff, P., Alt, J., Nelson, N. and Herrmann, R.G. (1985) Genes and transcripts for the ATP synthase CF<sub>0</sub> subunits I and II from spinach thylakoid membranes. **Mol. Genet. Gen.** *199*, 290-299.

64. Schuster, G., Nechushtai, R., Nelson, N. and Ohad, I. (1985) Purification and composition of photosystem I reaction center of *Prochloron* sp., an oxygen-evolving prokaryote containing chlorophyll b. **FEBS Lett.** *191*, 29-33.
65. Nelson, N. (1986) Subunit structure and biogenesis of ATP synthase and photosystem I reaction center. **Methods Enzymol.** *118*, 352-369.
66. Azzy, A., Nelson, N. and Sigrist-Nelson, K. (1986) Extraction, purification, and reconstitution of the chloroplast N,N'-Dicyclohexylcarbodiimide-binding proteolipid. **Methods Enzymol.** *126*, 520-527.
67. Hauska, G. and Nelson, N. (1986) Reconstitution of H<sup>+</sup>-translocation and photophosphorylation with photosystem I reaction centers, PMS and CF<sub>1</sub> CF<sub>0</sub>. **Methods Enzymol.** *126*, 285-293.
68. Nechushtai, R., Schuster, G., Nelson, N. and Ohad, I. (1986) Photosystem I reaction centers from maize bundle-sheath and mesophyll chloroplasts lack subunit III. **Eur. J. Biochem.** *159*, 157-161.
69. Nelson, N. (1986) Functional assembly of the chloroplast H<sup>+</sup>-ATPase and photosynthetic reaction centers. **Biochem. Soc. Trans.** *14*, 5-7.
70. Fujita, N., Nelson, N., Fox, T.D., Claudio, T., Lindstrom, J., Riezman, H. and Hess, G. (1986) Biosynthesis of the *Torpedo californica* acetylcholine receptor  $\alpha$  subunit in yeast. **Science** *231*, 1284-1287.
71. Liveanu, V., Yocum, C.F. and Nelson, N. (1986) Polypeptides of the oxygen-evolving photosystem II complex; immunological detection and biogenesis. **J. Biol. Chem.** *261*, 5296-5300.
72. Fujita, N., Sweet, M.T., Fox, T.D., Nelson, N., Claudio, T., Lindstrom, J.M. and Hess, G.P. (1986) Expression of cDNAs for acetylcholine receptor subunits in the yeast cell plasma membrane. **Biochem. Soc. Symp.** *52*, 41-56.
73. Tittgen, J., Hermans, J., Steppuhn, J., Jansen, T., Jansson, C., Andersson, B., Nechushtai, R., Nelson, N. and Herrmann, R.G. (1986) Isolation of cDNA clones from fourteen nuclear-encoded thylakoid membrane proteins. **Mol. Gener. Gen.**, *204*, 258-265.
74. Cidon, S. and Nelson, N. (1986) Purification of N-ethylmaleimide sensitive ATPase from chromaffin granule membranes. **J. Biol. Chem.** *261*, 9222-9227.
75. Hicks, D.B., Nelson, N. and Yocum, C.F. (1986) Cyanobacterial and chloroplast F<sub>1</sub>-ATPases: cross-reconstitution of photophosphorylation and subunit immunological relationships. **Biochim. Biophys. Acta** *851*, 217-222.



76. Yanagita, Y., Abdel-Ghany, M., Raden, D., Nelson, N. and Racker, E. (1987) Polypeptide-dependent protein kinase from bakers' yeast. **Proc. Natl. Acad. Sci. USA** *84*, 925-929.
77. Udenfriend, S., Gerber, L. and Nelson, N. (1987) Scintillation proximity assay: A sensitive and continuous isotopic method for monitoring ligand/receptor and antigen/antibody interactions. **Anal. Biochem.** *161*, 494-500.
78. Moriyama, Y. and Nelson, N. (1987) The purified ATPase from chromaffin granule membranes is an anion-dependent proton pump. **J. Biol. Chem.** *262*, 9175-9180.
79. Nelson, N. (1987) A novel method for the detection of receptors and membrane proteins by scintillation proximity radioassay. **Anal. Biochem.** *165*, 287-293.
80. Nalin, C.M. and Nelson, N. (1987) Structure and biogenesis of chloroplast coupling factor CF<sub>0</sub>-CF<sub>1</sub>-ATPase. **Curr. Topics Bioenergetics** *15*, 273-294.
81. Nelson, N. (1987) The vacuolar proton-ATPase of eukaryotic cells. **BioEssays** *7*, 251-254.
82. Moriyama, Y. and Nelson, N. (1987) Nucleotide binding sites and chemical modification of the chromaffin granule proton-ATPase. **J. Biol. Chem.** *262*, 14723-14729.
83. Moriyama, Y. and Nelson, N. (1987) Internal anion binding site and membrane potential dominate the regulation of proton pumping by the chromaffin granule ATPase. **Biochem. Biophys. Res. Commun.** *149*, 140-144.
84. Nelson, N. (1988) Structure, function and evolution of proton-ATPases. **Plant Physiol.**, *86*, 1-3.
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88. Moriyama, Y. and Nelson, N. (1988) Purification and properties of a vanadate and N-ethylmaleimide sensitive ATPase from chromaffin granule membranes. **J. Biol. Chem.** *263*, 8521-8527.

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90. Mandel, M., Moriyama, Y., Hulmes, J.D., Pan, Y.-C.E., Nelson, H. and Nelson, N. (1988) Cloning of cDNA sequence encoding the 16-kDa proteolipid of chromaffin granules implies gene duplication in the evolution of H<sup>+</sup>-ATPases. **Proc. Natl. Acad. Sci. USA** *85*, 5521-5524.
91. Wang, S.-Y., Moriyama, Y., Mandel, M., Hulmes, J.D., Pan, Y.-C. E., Danho, W., Nelson, H. and Nelson, N. (1988) Cloning of cDNA encoding a 32 kDa protein - an accessory polypeptide of the H<sup>+</sup>-ATPase from chromaffin granules. **J. Biol. Chem.** *263*, 17638-17642.
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99. Moriyama, Y. and Nelson, N. (1989) Lysosomal H<sup>+</sup>-translocating ATPase has a similar subunit structure to chromaffin granule H<sup>+</sup>-ATPase complex. **Biochem. Biophys. Acta** *980*, 241-247.
100. Nelson, N. and Taiz, L. (1989) The evolution of H<sup>+</sup>-ATPases. **TIBS** *14*, 113-116.
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- of the four subunits of the *Torpedo californica* nicotinic acetylcholine receptor in *Saccharomyces cerevisiae*. **J. Biol. Chem.** *264*, 15022-15027.
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  105. Chitnis, P.R., Reilly, P.A., Miedel, M.C. and Nelson, N. (1989) Structure and targeted mutagenesis of the gene encoding 8-kDa subunit of photosystem I from the cyanobacterium *Synechocystis* sp. PCC 6803. **J. Biol. Chem.** *264*, 18374-18380.
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