

CURRICULUM VITAE

• **Education**

B.Sc. 1968-1970 Ben-Gurion
University of the Negev, Beer Sheva,
Department of Biology and The Hebrew
University, Jerusalem, Department Of Life
Sciences, Biology.

M. Sc. (with distinction) 1970 - 1972 BGU,
Beer Sheva, Department Of Biology and The
Hebrew University, Jerusalem Department Of
Life Sciences, Plant Physiology.

Advisors: Prof. H. Lips & Dr. N. Bejerano.

Title of Thesis: Studies on the induction of nitrate reductase by nitrite.

Ph.D 1972-1979 The Hebrew University of Jerusalem and BGUv, Beer
Sheva Department Plant Physiology.

Advisors: Prof. A. M. Mayer & Prof. H. Lips.

Title of Thesis: Control of nitrate reduction in higher plants.

• **Personal Details**

Name: Drora Kaplan

Date and place of birth: March 4, 1943, Haifa, Israel

Regular military service 1961 – 1962 "Nachal"

Address and telephone number at work:

Department of Environmental Hydrology & Microbiology, Institute for
Water Sciences and Technologies (IWST), The Jacob Blaustein Institute for
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• **Employment History**

- Nov.2005-Apr.2006 Sabbatical leave, Environmental Microbiology, The Center for Biological Research of the Northwest, La Paz, P.O. Box 128, B.C.S., Mexico
- 1991-1992 Sabbatical leave, Department of Horticulture, Purdue University, Lafayette, Indiana.
- 1989-present Senior Lecturer, Department of Environmental Hydrology and Microbiology, IWST (previously Laboratory for Environmental and Applied Microbiology), BIDR, BGU, Sede Boqer Campus.
- 1983-1989 Lecturer, Laboratory for Environmental and Applied Microbiology, BIDR, BGU, Sede Boqer Campus.
- 1982-1983 Researcher (tenure-track), Laboratory for Environmental and Applied Microbiology, BIDR, BGU, Sede Boqer Campus.
- 1979-1982 Research Associate, Charles F. Kettering Research Laboratory, Yellow Springs, Ohio, USA. Research on: Biological problems of photosynthesis and nitrogen fixation.
- 1970-1979 Teaching assistant, Biology Department, BGU
- 1963-1968 Science teacher in high school (Kibbutz Gat).

• **Professional Activities**

Positions in academic administration

- Nov. 2003 – Nov. 2006 Head, Department of Environmental Hydrology & Microbiology, ZIWR, BIDR, BGU, Sede Boqer Campus.
- July 1986 -Oct. 1987 Acting Head, Laboratory for Environmental and Applied Microbiology, BIDR, BGU, Sede Boqer Campus.

Membership of professional/scientific societies

1980 - present	The American Society of Plant Physiologists
1970 - present	The Israeli Society of Botany
1983 - present	The American Society for Microbiology
1990 - present	International Association on Water Pollution Research and Control
1999 - present	The International Society for Microbial Ecology
2001- present	The International Symbiosis Society
2005-present	International Water Association

Courses taught

Plant Physiology, undergraduate, BGU.

Cell Biology, undergraduate, BGU

Nitrogen Metabolism in Plants, graduate, BGU

Botany of Lower Plants (algae, fungi, bryophytes and pteridiophytes),
undergraduate, BGU

Structure and Function of Plants, graduate, BGU

Symbiosis, undergraduate and graduate, BGU

Bioremediation of organics and inorganics in soils and water, undergraduate and
graduate, BGU

Bioremediation of heavy metal contamination in water and soils, graduate,
Albert Katz International School for Desert Studies, BGU

Introductory course in Water Resources and Management in Dry Regions,
graduate, Albert Katz International School for Desert Studies, BGU (jointly
with members of the Department of Environmental Hydrology &
Microbiology)

• Scientific Publications

Chapters in collective volumes - Conference proceedings, Festschrifte, etc.

1. D. Kaplan, N. Roth-Berjerano and S. H. Lips (1974) Photosynthesis and the induction of Nitrate Reductase in Plants. In: (M. Avron, ed) Proceedings of the Third International Congress on Photosynthesis. Elsevier Scientific Publishing Co., Amsterdam, pp. 1517-1524.

2. D. Kaplan, A. M. Mayer and S. H. Lips (1977) Effect of cyanide and nitrite on the activity of nitrate reductase, In: (C. T. Cutting and E. J. Hewitt, eds) Proceedings of the 6th Long-Ashton Symposium of Nitrogen Assimilation of Plants. pp. 315-320.
3. G. A. Peters, O. Ito, V. V. S. Tyagi and D. Kaplan (1981) Physiological studies on N₂ fixing *Azolla*. In: (T. M. Lyons, D. W. Rains, R. C. Valentine, R. C. Huffaker and D. A. Phillips, eds), Genetic Engineering Symbiotic Nitrogen Fixation and Conservation of Fixed Nitrogen. Plenum Press, New York, pp. 343-362.
4. G. A. Peters, O. Ito, V. V. S. Tyagi, B. C. Mayne, D. Kaplan and H. E. Calvert (1981) Photosynthesis and N₂ fixation in the *Azolla-Anabaena* symbiosis, In: (A. H. Gibson and W. E. Newton, eds) Current Perspectives in Nitrogen Fixation. Australian Academy of Science, Canberra, pp. 121-124.
5. G. A. Peters, D. Kaplan, J. C. Meeks, K. M. Buzby, B. H. Marsh and J. L. Corbin (1985) Aspects of nitrogen and carbon interchange in the *Azolla-Anabaena* symbiosis. In: (P. W. Ludden and J. E. Burris, eds.) Nitrogen Fixation and CO₂ metabolism. Elsevier Science Pub. Co. Inc., New York, pp. 213-222.
6. D. Kaplan, A. Abeliovich and S. Ben-Yaakov (1985) The fate of trace elements in an oxidation ponds type wastewater treatment plant, In: (T. D. Lekkas, ed) Heavy Metals in the Environment, Vol 1. CEP Consultants, Ltd. pp. 122-125.
7. D. Kaplan, A. Richmond, L. Dubinsky and S. Aronson (1986) Mineral nutrition, In: (A. Richmond, ed.) Algal Biomass. CRC Press, Boca Raton, Florida, pp.147-198.
8. D. Kaplan, A. Abeliovich, S. Ben-Yaakov (1986) Chelating of heavy metals by organic compounds in domestic waste water, In: (J. N. Lester, R. Perry and R. M. Sterritt, eds) Chemicals in the Environment. Selper, Ltd., Lisbon, London, pp. 462-469.
9. D. Kaplan, (1988) Algal polysaccharides as natural metal chelators, In: (J. Ramus and M. C. Jones, eds.) Polysacchharides from Microalge: a New Agroindustry, Proceedings of an International Workshop. pp. 51-55. U.S –

Israel Binational Agriculture Research & Development Fund North
Carolina Biotechnology Center

10. D. Kaplan, D. Christiaen and S. Malis (1988) Binding of heavy metals by algal polysaccharides, In: (T. Stadler, J. Mollion, M.-C. Verdus, YU. Karamanos, H. Morvan and D. Christiaen, eds) *Algal Biotechnology*. Elsevier Science Publications, pp. 179-187.
11. A. Abeliovich and D. Kaplan (1999) Nitrogen and Nitrification, In: (M. Juanico, I. Dor, eds) *Reservoirs for Wastewater Storage and Reuse*. Springer-Verlag Berlin Heidelberg, pp. 159-171.
12. D. Kaplan (2004) Absorption and adsorption of heavy metals by microalgae, In: A Richmond (ed.) *Handbook of Microalgal Culture: Biotechnology and Applied Phycology*. pp. 439-447. Blackwell Publishing, UK.

Refereed articles and refereed letters in scientific journals

1. S. H. Lips, D. Kaplan and N. Roth-Bejerano (1973) Studies on the induction of nitrate reductase in bean-seed cotyledons. *Eur. J. Biochem.*, **37**: 589-592.
2. D. Kaplan, S. H. Lips and N. Roth-Bejerano (1974) Nitrate reductase as a product inducible enzyme. *Eur. J. Biochem.*, **49**: 393-398.
3. D. Kaplan, A. M. Mayer and S. H. Lips (1978) Nitrate activation of nitrate reductase in higher plants. *Planta*, **138**: 205-209.
4. D. Kaplan and G. A. Peters (1981) The *Azolla-Anabaena azollae* relationship, X. N₂ fixation and transport in main stem axes. *New Phytol.*, **89**: 337-346.
5. G. A. Peters, H. E. Calvert, D. Kaplan, O. Ito and R. E. Toia, Jr. (1982) The *Azolla-Anabaena* symbiosis: Morphology physiology and use. *Israel J. Bot.*, **31**: 305-323.
6. D. Kaplan and S. H. Lips (1984) A comparative study of nitrate reduction and the oxidation of glycolate. *Israel J. Bot.*, **33**: 1-11.
7. D. Kaplan, A. M. Mayer and S. H. Lips (1984) A constitutive component of nitrate reductase in barley leaves. *Israel J. Bot.*, **33**: 13-23.

8. G. A. Peters, D. Kaplan and H. E. Calvert (1985) Solar-powered N₂ fixation in ferns: The *Azolla-Anabaena* symbiosis. Proc. Royal Soc. Edinburgh **86B**: 169-177.
9. D. Kaplan, H. E. Calvert and G. A. Peters (1986) The *Azolla-Anabaena azollae* relationship, XII. Nitrogenase activity and phycobiliproteins of the endophyte as a function of leaf age and cell type. Plant Physiol., **80**: 884-890.
10. D. Kaplan, Z. Cohen and A. Abeliovich (1986) Optimal growth conditions for *Isochrysis galbana*. Biomass, **9**: 37-48.
11. D. Kaplan, D. Raphaeli and S. Ben-Yaakov (1987) Application of personal computers in the analytical laboratory: III. ASV analysis. Talanta, **34**: 709-714.
12. D. Kaplan, A. Abeliovich and S. Ben-Yaakov (1987) The fate of heavy metals in wastewater stabilization ponds. Water Res., **21**:1189-1194.
13. D. Kaplan, D. Christiaen and S. (Malis) Arad (1987) Chelating properties of extracellular polysaccharides from *Chlorella* spp. Appl. Environ. Microbiol., **53**: 2953-2956.
14. D. Kaplan and G. A. Peters (1988) Interaction of carbon metabolism in the *Azolla-Anabaena* symbiosis. Symbiosis, **6**:53-68.
15. D. Kaplan, A. Abeliovich, Y. Heimer, and P. B. Goldsbrough (1995) Cadmium toxicity and resistance in *Chlorella* sp. Plant Science, **109**: 129-137.
16. D. Kaplan and G. A. Peters. (1998) The *Azolla-Anabaena azollae* relationship, XIV. Chemical composition of the association and soluble carbohydrates of the association, endophyte-free *Azolla*, and the freshly isolated endophyte. Symbiosis, **24**: 35-50.
17. D. Kaplan, N. T. Prakash and A. Abeliovich (1998) Glutathione-induced recovery in *Chlorella* cells from metal toxicity. Fresenius Envir. Bull., **7**: 153-159.
18. D. Kaplan, R. Wilhelm and A. Abeliovich (2000) Interdependent environmental factors controlling nitrification in waters. Wat. Sci. Technol., **42**: 167-172.

Published scientific reports and technical papers

1. A. Abeliovich, D. Kaplan, Y. Avisar, Z. Cohen, A. Vonshak and A. Richmond (1983) Development of outdoor system for production of lipid-rich halotolerant microalgae, Progress report submitted to SERI.
2. A. Abeliovich, D. Kaplan, Y. Avisar, Z. Cohen, A. Vonshak and A. Richmond (1984) Development of outdoor system for production of lipid-rich halotolerant microalgae, Progress report submitted to SERI.
3. S. Ben Yaakov, A. Abeliovich and D. Kaplan (1984) The fate of trace elements in recycled waters. Progress report submitted to the European Community and the Israeli National Council for Research and Development.
4. A. Abeliovich and D. Kaplan (1985) Biological oxidation of Fe^{2+} and H_2S in Arava brackish waters. Mekoroth Ltd.
5. A. Abeliovich, D. Kaplan, S. Boussiba, Z. Cohen, A. Vonshak and A. Richmond (1985) Development of outdoor system for production of lipid-rich halotolerant microalgae, Progress report submitted to SERI.
6. S. Ben Yaakov, A. Abeliovich and D. Kaplan (1985) The fate of trace elements in recycled waters. Progress report submitted to the European Community and the Israeli National Council for Research and Development.
7. S. Boussiba, A. Vonshak, Z. Cohen, A. Abeliovich, D. Kaplan and A. Richmond (1985) The effect of light on the mass production in two halotolerant microalgae *Nannochloropsis salina* and *Isochrysis galbana*. Report submitted to SERI.
8. S. Ben Yaakov, A. Abeliovich and D. Kaplan (1986) The fate of trace elements in recycled waters. Final report submitted to the European Community and the Israeli National Council for Research and Development.
9. S. Belkin, D. Kaplan and A. Abeliovich (1988) Microbial treatment for Ramat Hovav wastewater. 1st Annual Report.

10. D. Kaplan, B. Teltsch and C. J. Soeder (1995) Unbalanced nitrogen fluxes during the nitrification process in wastewater reservoirs. 1st Annual Report submitted to BMFT and MOSA.
11. D. Kaplan, B. Teltsch and C. J. Soeder (1996) Unbalanced nitrogen fluxes during the nitrification process in wastewater reservoirs. 2nd Annual Report submitted to BMFT and MOSA.
12. D. Kaplan, B. Teltsch and C. J. Soeder (1997) Unbalanced nitrogen fluxes during the nitrification process in wastewater reservoirs. 3rd Annual Report submitted to BMFT and MOSA.
- 13.

Invited plenary lectures at conferences/meetings

1. G. A. Peters, H. E. Calvert, D. Kaplan, O. Ito and R. E. Toia, Jr. (1982) The *Azolla-Anabaena* symbiosis: Morphology physiology and use. A Binational Israel-USA Workshop. Israel, May 1981.
2. D. Kaplan (1987) Algal polysaccharides as natural metal chelators. Polysaccharides from microalgae: A new agroindustry. An International Workshop. Beaufort, NC, USA, Oct. 1987.
3. D. Kaplan. (1988) Carbon and nitrogen metabolism in the *Azolla-Anabaena* symbiosis. Nitrogen fixation and symbiotic systems. A Binational Israel-Finland Workshop. Israel, Feb. 1988.
4. D. Kaplan (1988) Algal polysaccharides as natural metal chelators. BARD & North Carolina Biotechnology Center, Beaufort, South Carolina, pp. 51-55.

Presentation of papers at conferences/meetings

1. D. Kaplan, N. Roth-Bejanero and S. H. Lips (1974) Photosynthesis and induction of nitrate reductase in plants. In: Proc. of the 3rd International Congress of Photosynthesis. Rehovot, Israel (M. Avron, ed.), Vol. 21, pp. 1517-1524.
2. G. A. Peters, O. Ito, V. V. S. Tyagi, B. C. Mayne, D. Kaplan and H. E. Calvert (1981) Photosynthesis and N₂-fixation in the *Azolla-Anabaena*

- symbiosis. In: Current Perspectives in Nitrogen Fixation: Proc. of the 4th International Symposium on Nitrogen Fixation, (A. H. Gibson and W. E. Newton, eds.), p. 456, Canberra, Australian Academy of Science.
3. D. Kaplan and G. A. Peters (1981) Nitrogen fixation and transport in *Azolla*. In: Proc. of Plant Physiology Meeting, Quebec.
 4. G. A. Peters and D. Kaplan (1981) Soluble carbohydrate pool in the *Azolla-Anabaena* symbiosis. In: Proc. of Plant Physiology Meeting, Quebec.
 5. R. E. Toia, Jr., D. Kaplan, A. J. Mort and G. A. Peters (1982) Composition of the *Azolla-Anabaena* relationship. In: Proc. of Plant Physiology Meeting, Urbana, Indiana.
 6. D. Kaplan and A. Abeliovich (1983) Inhibition of growth of *Chlorella* sp. by penicillin. In: 6th International Congress on Photosynthesis, Brussels, Belgium.
 7. D. Kaplan, A. Abeliovich and S. Ben-Yaakov (1985) The fate of trace elements in an oxidation ponds type wastewater treatment plant. In: Heavy Metals in the Environment. (T. D. Lekkas, ed.), Vol. I CEP Consultants, Edinburgh, pp. 122-124.
 8. D. Kaplan, A. Abeliovich and S. Ben-Yaakov (1985) The fate of metals in a domestic wastewater treatment plant. Proc. Internat. Symp. on Scientific Basis for Water Resources Management. International Association of Hydrological Sciences, Jerusalem.
 9. D. Kaplan, A. Abeliovich and S. Ben-Yaakov (1986) Chelating of heavy metals by organic compounds in domestic wastewater. In: Chemicals in the Environment (J. N. Lester, R. Perry and R. M. Sterritt, eds.), Selper Ltd. pp. 462-469.
 10. S. Ben-Yaakov and D. Kaplan (1987) An ASV work station for wastewater treatment studies. In: International Symposium on Electroanalysis and Sensors in Biomedical, Environmental and Industrial Sciences. Cardiff, Wales.
 11. D. Kaplan, D. Christiaen and S. (Malis) Arad (1987) Binding of heavy metals by algal polysaccharides. In: Algal Biotechnology (T. Stadler, J.

- Mollion, M. -C. Verdus, Y. Karamanos, H. Morvan, D. Christiaen, eds.), Elsevier Applied Science, London. pp. 179-187.
12. S. Belkin, E. Shochat, D. Kaplan and A. Abeliovich (1989) Biological treatment of complex chemical industrial effluents. 5th International Symposium on Microbial Ecology (ISME 5) Kyoto, Japan, p. 207.
 13. D. Kaplan, S. Ben-Yaakov and A. Abeliovich (1989) Metal binding proteins in domestic wastewater stabilization ponds. 5th International Symposium on Microbial Ecology (ISME 5) Kyoto, Japan, p. 109.
 14. D. Kaplan, Y. Heimer and A. Abeliovich (1990) Effect of glutathione and cysteine on cadmium resistance in *Chlorella* sp. Recent Advances in Algal Biotechnology, Tiberias, Israel.
 15. D. Kaplan, Y. M. Heimer and A. Abeliovich (1992) Cadmium resistant cell line of *Chlorella* sp. In: Proc. Plant Physiology Meeting, Pittsburgh, Pennsylvania.
 16. D. Kaplan, B. Teltsch and A. Abeliovich. (1995) Environmental and microbial processes affecting accumulation of nitrites. Microbial Physiology and Gene Regulation: Emerging Principles and Applications. 10-14 December, The Hague, The Netherlands.
 17. M Grinberg,., A Nejidat,., R Shaked,., D Kaplan,., and Y Heimer,., (1995). Characterization of transgenic Arabidopsis plants over expressing nitrate reductase. Israel Botanical Society Technion, Haifa. Israel J. Plant Sci. 1995, 43: 181.
 18. N. T. Prakash and D. Kaplan (1997) Metal toxicity in *Chlorella* cells and recovery in the presence of glutathione. In: Proc. National Symposium on Microbial Technologies for Environmental Management and Resource Recovery, New Delhi Oct. 1-2.
 19. D. Kaplan, A. Vonshak, R. Wilhelm, B. Teltsch and A. Abeliovich (1998) Analysis of factors affecting nitrification in a wastewater reservoir: field observations. 8th International Symposium on Microbial Ecology, Halifax, Canada August 9-14.
 20. R. Wilhelm, A. Vonshak, J. Groeneweg, A. Abeliovich and D. Kaplan (1998) Analysis of factors inhibiting nitrification in a waste water reservoir: laboratory experiments on inhibition of nitrite oxidizers. 8th

International Symposium on Microbial Ecology, Halifax, Canada August 9-14.

21. D. Kaplan, R. Wilhelm and A. Abeliovich (1999) Interdependent environmental factors controlling nitrification in water. The 7th International Conference of the Israel Society for Ecology and Environmental Quality Sciences, June 13-18.
22. D. Kaplan, A. Makhsumkhanov, A. Nejidat, G. A. Peters, and Y. M. Heimer (2001) The effect of elevated CO₂ on the C/N ratio in *Azolla-Anabaena* symbiosis. 6th International Symposium on Inorganic Nitrogen Assimilation; from field to the genome, Reims, France July 8 – 12.
23. D. Kaplan, M. Azeb, Y. Akkara, A. Nejidat, E. Nahon, G. Granot and Y. M. Heimer (2003) Response of *Azolla -Anabaena* symbiosis to elevated CO₂ or nitrogen limiting conditions. 4th International Symbiosis Society Congress in Halifax, Canada. August 17-23.
24. D. Kaplan, M. Azeb, Y. Akkara G. Granot and Y. M. Heimer (2004) The presence of the symbiont in the *Azolla-Anabaena* symbiosis is essential for the ability of the fern to utilize combined nitrogen. The XIV International Congress on Nitrogen Fixation, Beijing, China Oct. 27-Nov. 1

- **Present Academic Activities**

Over the years my research interest into two major categories:

A) Studies concerning various microbial aspects of water pollution. The main

goal is to understand microbial processes occurring in domestic and industrial wastewater from various sources, in order to develop cost-effective and feasible biotechnologies for removing pollutants from water. The following are some of the projects in which I have been involved: (1) Avoiding clogging of underground drain pipe systems by iron bacteria. (2) The fate of trace elements in domestic wastewater and soils irrigated by treated effluents. (3) Removal of iron and hydrogen sulfite from Numibian-stone aquifer in the Arava valley. (4) Biological treatment of the Ramat Hovav Chemical Industrial effluents. (5) Biodegradation of organic pollutants in industrial wastewater. (6) Unbalanced nitrification in wastewater reservoirs. Plant microbe interaction with emphasize *Azolla-Anabaena azollae* symbiosis.

B) Plant- Microbe interaction with emphasize of the symbiotic association between the eukariotic water fern *Azolla* and its prokaryotic cyanobacterial endosymbiont *Anabaena azollae*. My research was mainly aimed at understanding the factors responsible for the co-ordination of carbon and nitrogen metabolism in the system.

Current studies include: heavy metals in the environment; bioremediation processes in wastewater reservoirs; nitrification in wastewater reservoirs. carbon and nitrogen metabolism; effect of elevated CO₂ on symbiotic water plants; These can be grouped under two main research areas:

- (a) The biological processes leading to removal and or detoxification of toxic heavy metals from contaminated wastewater (cadmium, nickel and others), by microalgae. The physiological, biochemical and molecular aspects confirming cadmium resistance in the microalga *Chlorella* sp that was isolated from domestic wastewater treatment in Beer Sheva is being examined. The aim is to reduce the concentrations of the pollutant to a level that will at least allow safe release of the effluents, and if possible will permit the reuse of the treated water for agricultural use.
- (b) Pathogen removal and surfactant biodegradation were investigated using pilot scale Recirculating Vertical Flow Constructed Wetlands (RVFCW) in collaboration with Dr. Amit Gross and Dr. Katherine Baker a visiting scientist in our department.
- (c) The effect of global change, mainly the effect of increasing CO₂ concentration on vegetation, using *Azolla-Anabaena* symbiosis, as a model system. Unlike most plants, this symbiotic system between the water fern *Azolla* and the N₂-fixing cyanobacterium *Anabaena azollae* is recalcitrant to increased levels of CO₂. The overall aim is to understand the mechanism(s) enabling the system to withstand high CO₂ levels without loss of the biomass nutritional value.