Αντώνης Κούσης, ο επιστήμων – πολίτης

Antonis Koussis, the epistemon – polites

Δημήτρης Κουτσογιάννης
Σχολή Πολιτικών Μηχανικών
Εθνικό Μετσόβιο Πολυτεχνείο

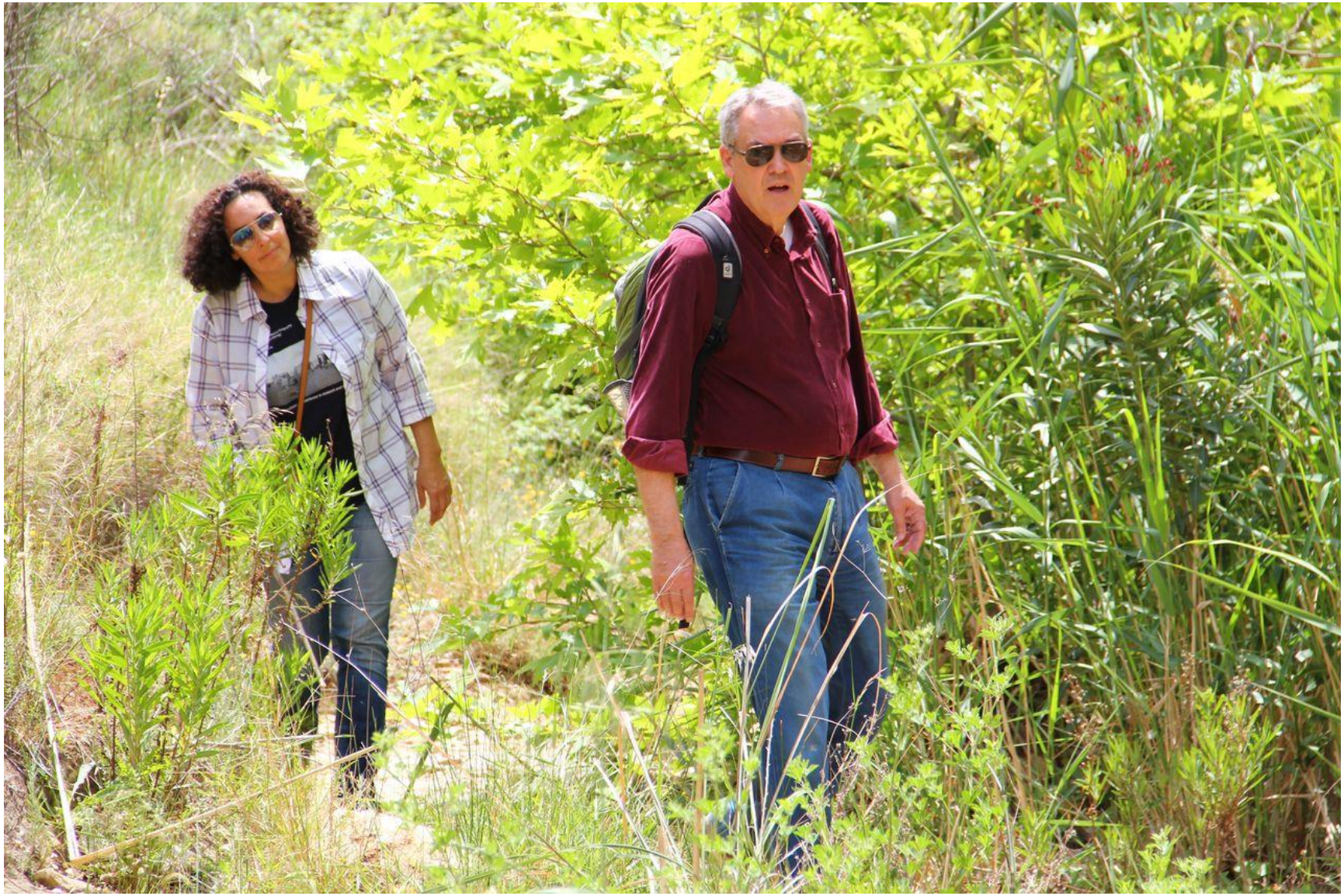
Demetris Koutsoyiannis
School of Civil Engineering
National Technical University of Athens

Part A
Thanking AK

Reasons to thank him

- He is a gentleman, a kind person, a generous teacher, collaborator and friend
- He has offered a lot and continues to offer in science and engineering at a level of excellence, in terms of:
  - scientific publications
  - engineering studies
  - services to the international scientific community
- He has offered important service to our country, both in the scientific and the societal sector (policy development and application)
- To do so, he returned to Greece from abroad sacrificing a successful career
- He is an educated man offering his broad knowledge to all

Extending our thanks…



Antonis Koussis (by D. Koutsoyiannis)

Research interests

- Water Resources Engineering & Management
- Modelling Flow & Solute Transport in Groundwater
- Flood Routing & Watershed Hydrology
- Regulatory: Civil Protection/Flood Emergencies & EU Water Framework Directive on integrated river basin management for Europe

Civilian trajectory

- Born in Athens, Greece
- Educated mostly in Germany
  - November 1970: Dipl. Ing., Technische Hochschule Darmstadt (Civil Eng.)
  - February 1975: Dr.-Ing., Technische Hochschule Darmstadt, Germany
    (Water resources engineering: hydraulics, hydromechanics, hydrology)
- Civil/Military service in Greece
  - 1975: Military service in the Greek Air Force
  - 1998-2000: Director General, Institute of Geology & Mineral Exploration (IGME)
- Worked in Germany, USA and Greece with breaks in Spain, Cyprus and Sweden

Professional trajectory

11/1995 – 12/2013	Director of Research, National Observatory of Athens, Greece
2/2012 – 7/2012	Visiting Researcher, Dept. Natural Geography & Quaternary Geology, Stockholm University
9/2006 – 1/2007	Visiting Professor, Department of Civil & Env. Eng., University of Cyprus
1995	Visiting Professor, Dept. Ingeniería Química, Universidad de Málaga
8/1991 – 9/1994	Prof. Hydrogeology & Water Resources Engineering, The University of Kansas, USA
1/1985 – 6/1985	Visiting Fellow, Department of Civil Engineering, Princeton University, USA
9/1980 – 6/1991	Associate Professor of Civil and Environmental Engineering (1980-1982 Assistant Professor), Vanderbilt University, Nashville, Tennessee, USA
1979 – 1980	Assistant Professor of Civil Engineering, University of Florida, USA
1976 – 1979	Assistant Professor of Civil Engineering, Northeastern University, Boston, USA
3/1976 – 6/1976	Visiting Fellow, Department of Mechanical Engineering, Wayne State University, Detroit, Michigan, USA
11/1970 – 3/1975	Dozent & Instruktor, Institut für Hydraulik & Hydrologie, Technische Hochschule Darmstadt, Germany

University service

- Teaching
  - Undergraduate: Fluid Mechanics; Hydraulic Engineering; Hydrology; Water Resources Science
  - Graduate: Groundwater Hydrology; Open Channel Hydraulics; Hydraulic Transients; Water Resources Eng.; Contaminant Transport; Flow & Transport in Environmental Systems; Mathematical Modelling Seminar
- Graduate Student Guidance: 13 PhD & MSc students; PhD External Examiner
- Administration
  - TH Darmstadt, Member, Gov. Board, Institut für Hydraulik & Hydrologie, 1973-75
  - Univ. Florida: Reviewer, Coastal & Oceanographic Eng. Research Proposals, 1980
  - Vanderbilt University:
    - School of Engineering Committees: Computing, 1983-85, Curriculum, 1982-84
    - Chair, Speakers Committee, McTyeire International House, 1983-1986
    - Committee Member: Student Activity Fee, 1986; Holiday Program, 1987
    - Elected to the Faculty Senate, 1986-89: Member, Academic Services & Policies Committee, 1986-1988. Chair, Student Affairs Committee, 1988-1989
  - University of Kansas: Dept. Geology Committees: Grad. Studies & Program Admissions

Professional service

- Member of Societies: American Geophysical Union; American Society of Civil Engineers; National Ground Water Association; European Geophysical Union
- Member, Hydraulics Group Executive Committee of the Boston Society of Civil Engineers Section, ASCE, 1978-1979
- Member, Grants Review Panel for Environmental Chemistry and Physics/Water, Environmental Protection Agency, 1980-1983, 1990-1993
- Member, Committee on Use of Models, Urban Storm Drainage joint Section of IAHR and IAWPRC, 1981-85.
- Reviewer, R.S. Kerr Laboratory, EPA, Research Co-operative Agreements
- ASCE Committees: Groundwater 1989-91; Education Comput. Hydraulics, 1991-94
- Member, Surface & Ground Water Panel, Engineering Response to Global Climate Change; Planning & Research & Development Agenda, ASCE, 1990
- National Contact-Point, Task Force Environment-Water, DG Research, EEC
- EC-Expert: Desertification of the Mediterranean, DG "Research"; Towards a Sustainable/Strategic Management of Water Resources: Evaluation of Present Policies and Orientation for the Future, DG "Regional Development"
- Advisor, Ministry for the Environment, Physical Planning & Public Works for the EC/ DG "Environment" programmes CARACAS (1997-1998), Working Group Models, and CLARINET (1999), Working Group Soil Contamination
- Member of Greek National Hydrology Committee, UNESCO, 1999-2000
- Institute of Geology & Mineral Exploration of Greece, Governing Board: Vice-president 2/96-6/98; Director General 6/98-10/00; member Eurogeosurveys 1998-2000
- Reviewer for EC: DG "Research", Water Resources Research proposals, 1998 & 2000 (5th FP, also extended panel member), 2004; DG IST 1999-2002; WaterWorks 2014
- Reviewer of proposals submitted to the Swedish Research Agency FORMAS 2014-15
- Expert to CEDEX, Ministries of Environment & Public Works, Spain, for the study Inland Waters in the Mediterranean European Union Countries, 1999-2002

Community service
Journal Reviewer – Editorial Boards

- ASCE: Journal of Hydraulic Eng.; occasional reviews for J. Irrigation & Drainage Eng.; J. Environmental Eng.; J. Water Resources Planning & Management; J. Hydrologic Eng.
- Water Resources Research, AGU
- Journal of Hydrology
- Hydrology & Earth Systems Sciences (HESS)
- Occasional reviews for: Advances in Water Resources
- Computers and Geosciences
- Soil Science
- J. Computational & Applied Mathematics
- Hydrogeology Journal
- Natural Hazards & Earth System Sciences (NHESS).
- Associate Editor (2007-2013) Hydrological Sciences Journal (Reviewer since 2006).

Funding

Research Grants: 27 from 1973 – 2011:

2 M€ as Project Co-ordinator (NOA)

0.5 M€ in Project Participation (NOA)

0.3 M$ in the USA

0.1 MDM in Germany

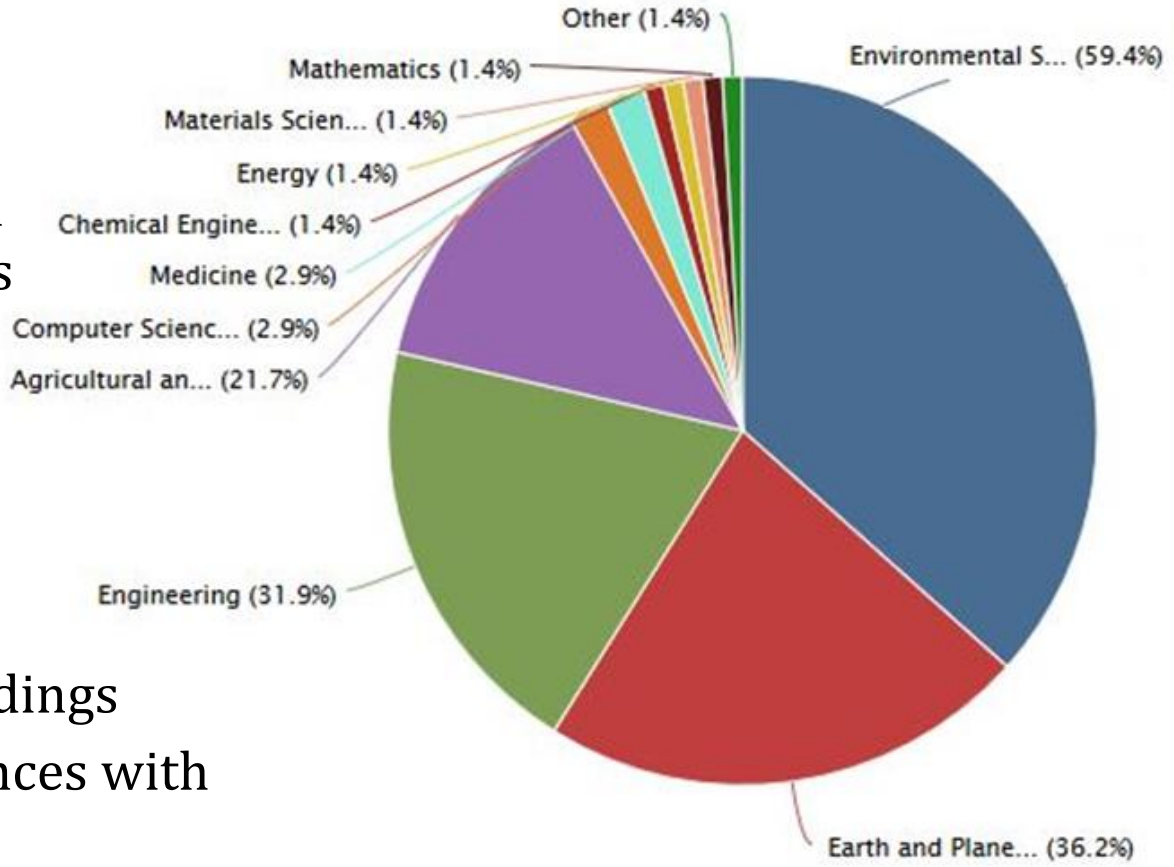
Infrastructure Grants: 2 from 1996 – 1998,

~ 192.000 € (NOA)

Government Funding for Research Infrastructures:

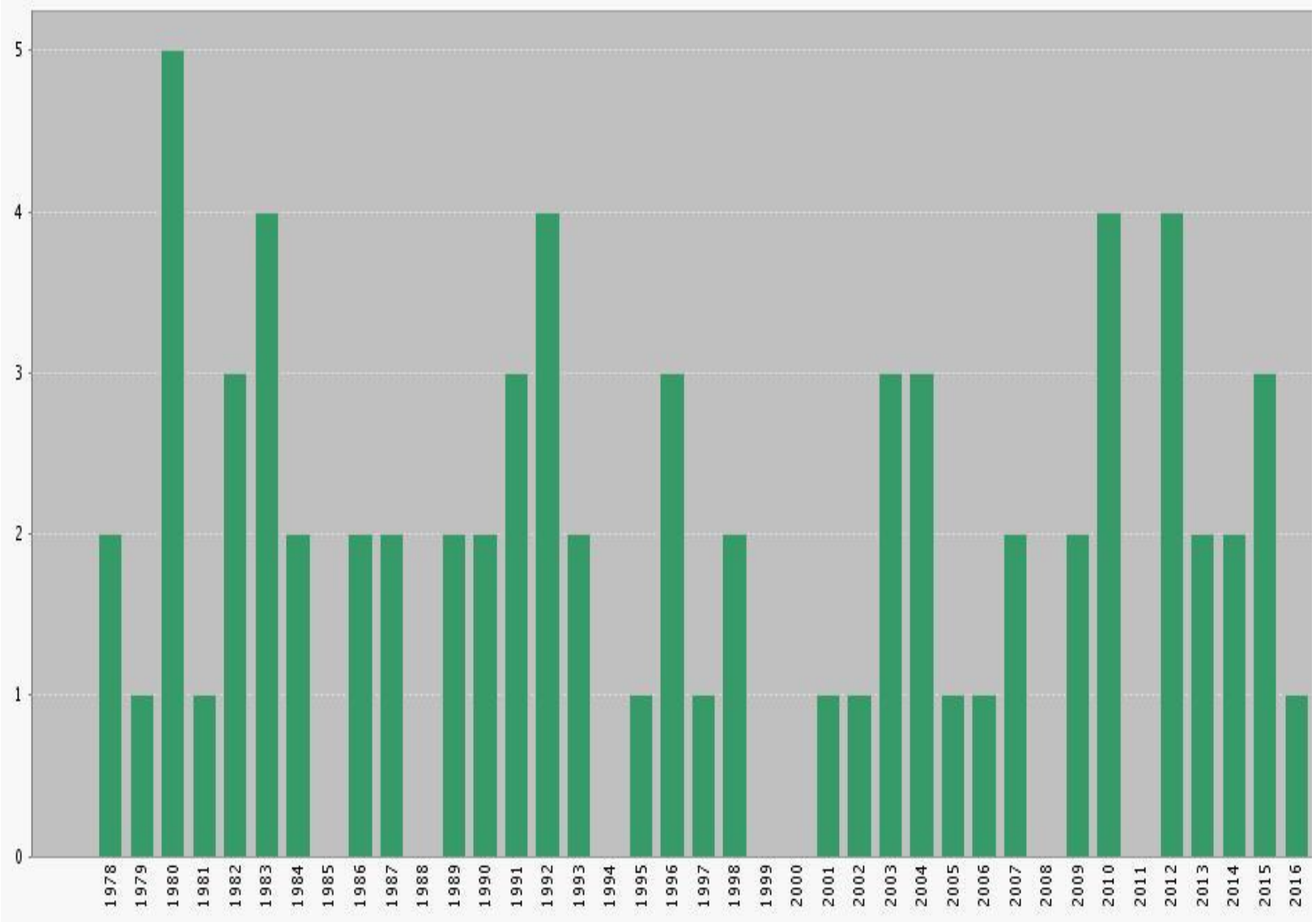
At IGME, secured funding of 52.8 M€ from the 3rd European Community Support Framework (CSF) for the Institute's activities & for the construction of new facilities of the Institute. Also secured 3 M€ , from the 2nd CSF, for establishing the Greek Groundwater Monitoring Network.

Publications

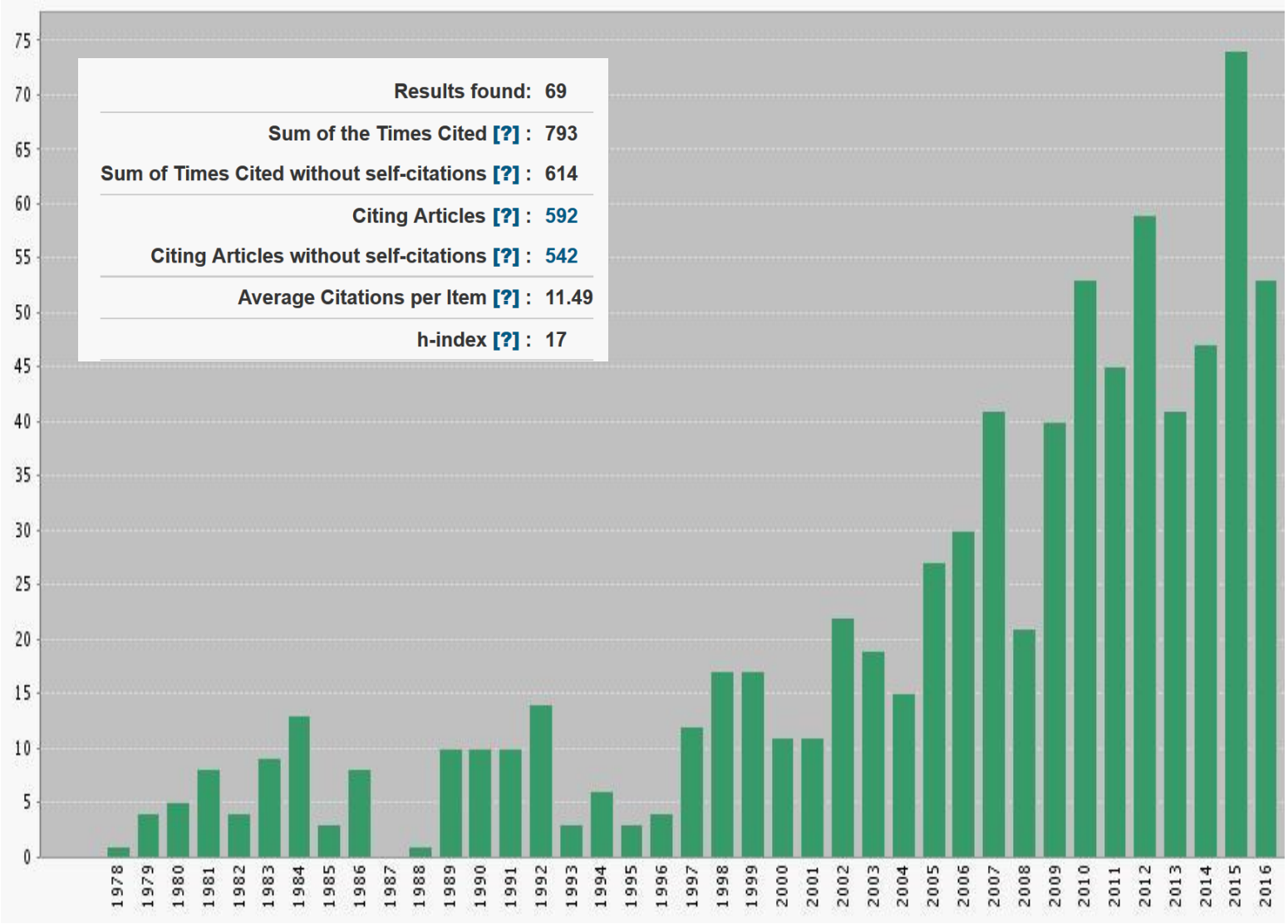


- 56 refereed papers in international journals
- 20 journal Discussions – Replies – Closures
- 2 book chapters
- 30 refereed papers in conference proceedings
- 24 papers in conferences with abstract evaluation
- 4 invited talks
- 13 other invited lectures in conferences & workshop meetings
- 24 reports
- 1 book reviews (published)
- 12 lecture notes

Journal publications (temporal distribution; ISI)



Citations – Bibliometric data



Major consultancies (to government/state agencies & to private companies in the USA, Colombia & Greece)

- US Army Corps of Engineers, Nashville District, 1987 and 1990
- Review of the design of a surface water quality monitoring network for runoff from surface coal mining operations in Kentucky, USA, 1983
- Barge Waggoner Sumner & Cannon Engineers & Planners, Tennessee, 1984
- I.C. Thomasson Associates Inc. Consulting Engineers, Nashville, Tenn., 1986
- Greek Ministry of Public Works
- US EPA: research reviews; evaluation of Groundwater Research Center, Ada, Oklahoma.
- Association of Municipalities of Attica , 1996
- Instituto Mi Rio, Medellin, Colombia: Contamination analysis for Rio Medellin, 1994.
- Public Power Corporation of Greece, May 1999
- Ministry of Agriculture, Natural Resources and Environment (Water Development Department), 2006, Republic of Cyprus
- Report to the court-appointed expert, Summer 2006, Athens
- Member of the experts' team headed by D.P. Lalas: Study for the Institute of Local Administration, Athens, Greece, 2007-2008
- Design of a Hydrometric Network for Kephisos River & its major tributaries; Modelling of the hydrologic response of the Kephisos River Basin, NEB Ltd., Athens, 2009-2010

Invited international lecturing-teaching (selected)

- Groundwater Contamination Modeling, Short Course for U.S. Army Corps of Engineers, Nashville, 5/1990
- Seminario Taller sobre Manejo Integral de la Cuenca Urbana del Rio Medellín, Medellin, Colombia, 8/1994
- Aguas Subterraneas in graduate course Contamination de Suelos y Aguas Residuales – Tecnicas de Limpieza, Universidad de Gran Canaria, Gran Canaria, Spain, March 1995
- Management of water resources in demand-stressed regions: A Mediterranean Perspective, invited lecture in the Seminar "Preparing the Future: The European Spatial Development Perspective", DG 16/ECC and the Hellenic Ministry for the Environment, July 1998, Thessaloniki
- The management of water resources in Greece: Issues, laws and problems, Workshops/Seminars "Aguas Continentales en los Países Mediterráneos de la Unión Europea", organised by CEDEX – Ministerio de Fomento, 15-16 July 1999 and 4-6 October 2000, Madrid, Spain
- Groundwater Contamination, Graduate Programme, Dept. of Geology, University of Patras, Greece, 1999
- Floods in graduate course Risk Management and the Environment, Ecole des Mines, Alés, France, Nov. 2002
- Criterios y herramientas para la preservación y recuperación de las aguas subterráneas, in graduate programme Gestión Compatible de los Recursos Industriales, Universidad Internacional de Andalucía (Campus Antonio Machado), Baeza, Spain, August 2003
- Bases para el control y la recuperación de aguas subterráneas, graduate programme Hacia un Uso Sostenible de los Recursos Naturales, Universidad Internacional de Andalucía, Campus Málaga, July 2007

Current international collaboration

- Stockholm University: G. Destouni, C. Prieto
- GWEN - Global Wetland Ecohydrology Network – An Agora for Scientists and Study Sites
- NEO: Navarino Environmental Observatory
- Cyprus Uni Tech.: E. Akylas
- Uni Autonoma Madrid: J.J. Rodriguez
- Uni Malaga: J. Rodriguez-Mirasol & T. Cordero,
- Vanderbilt U, USA: A. Bowers,
- US Army Corps of Engineers: D. Syriopoulou

Research collaboration of AK with Itia@NTUA

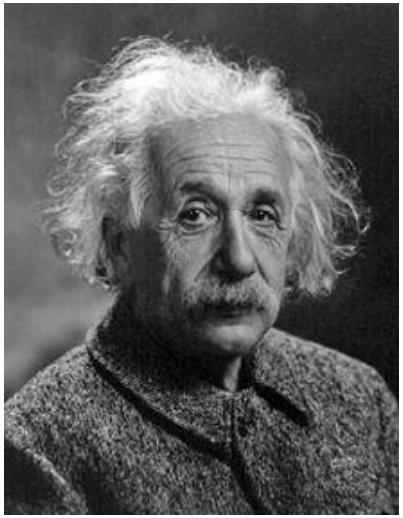
- DEUCALION – Assessment of flood flows in Greece under conditions of hydroclimatic variability: Development of physically-established conceptual-probabilistic framework and computational tools (2011–2014, funded by the General Secretariat of Research and Technology)
- OpenHI: (Open Hydrological Information; 2016-2019+)
  - Part of the the HIMIOFoTS Network (Hellenic Integrated Marine and Inland Water Observing, and Offshore Technology System) for the development of National Infrastructure for Marine Research and Water Resources
  - Part of the National Roadmap for Research Infrastructure

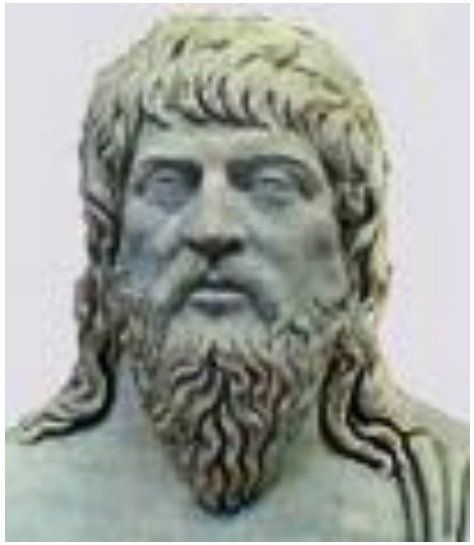
Part B
Reflections from a 18-year long interaction

With friendly and provocative dedication

A big philosophical disagreement also affecting science and scientists

Jedenfalls bin ich überzeugt, daß der nicht würfelt
I, at any rate, am convinced that He [God] does not throw dice
(Albert Einstein, in a letter to Max Born in 1926)





Αἰών παῖς ἐστι παίζων πεσσεύων
Time is a child playing, throwing dice
(Heraclitus; ca. 540-480 BC; Fragment 52)

An interaction in a review of a paper

Hydrol. Earth Syst. Sci., 14, 585–601, 2010
www.hydrol-earth-syst-sci.net/14/585/2010/

Hydrology and Earth System Sciences

HESS Opinions

"A random walk on water"

D. Koutsoyiannis

Hydrol. Earth Syst. Sci. Discuss., 6, C3034–C3039, 2010
www.hydrol-earth-syst-sci-discuss.net/6/C3034/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "HESS Opinions
"A random walk on water"" *by* D. Koutsoyiannis

A. Koussis (Referee)

From AK's comment:

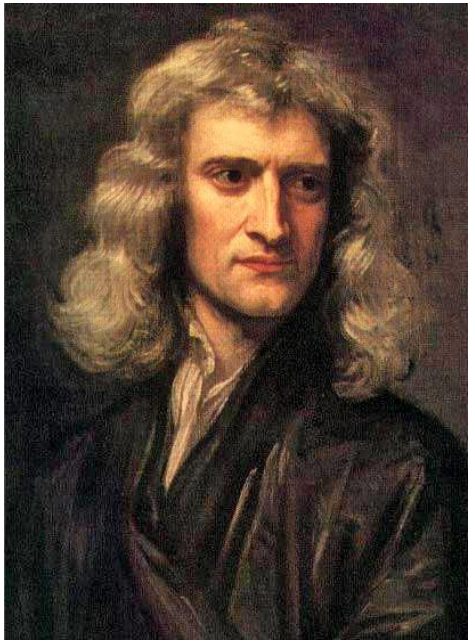
*The **analytical** [solution]* (*continuous-time dynamics*) *would always start from the slightly perturbed initial condition and would **advance the solution directly to any future time**... Formulating the problem also in continuous time (analytically) has the merit that the system's intrinsic unpredictability could be separated from the uncertainty caused by the propagation of the numerical error*.

Determinism and the clockwise universe

- Johannes Kepler (1571-1630), Galileo Galilei (1564-1642) and René Descartes (1596-1650) introduced mathematical concepts to natural philosophy (i.e., science)
- They also introduced the idea of a clockwork universe, leading to the philosophical proposition of *determinism*, still widely accepted in science
- It was perfected by the French mathematician and astronomer Pierre-Simon Laplace (1749-1827; cf. *Laplace's demon*)
- According to deterministic thinking, the roots of uncertainty about future are subjective, i.e. rely on the fact that we do not know exactly the present, or we do not have good enough methods and models. It is then a matter of time to eliminate uncertainty, with better data and better models.




Newton's awareness of the fragility of the universe (rejection of determinism)



For while comets move in very eccentric orbs in all manner of positions, blind fate could never make all the planets move one and the same way in orbs concentric, some inconsiderable irregularities excepted which may have arisen from the mutual actions of comets and planets on one another, and which will be apt to increase, till this system wants a reformation (Newton, *Opticks*, Query 31).

- Newton regarded the complexity and fragility of the universe as proof of the existence of God
- He rejected Leibniz' thesis that God would necessarily make a perfect world which requires no intervention from the creator
- Newton simultaneously made an argument from design and for the necessity of intervention

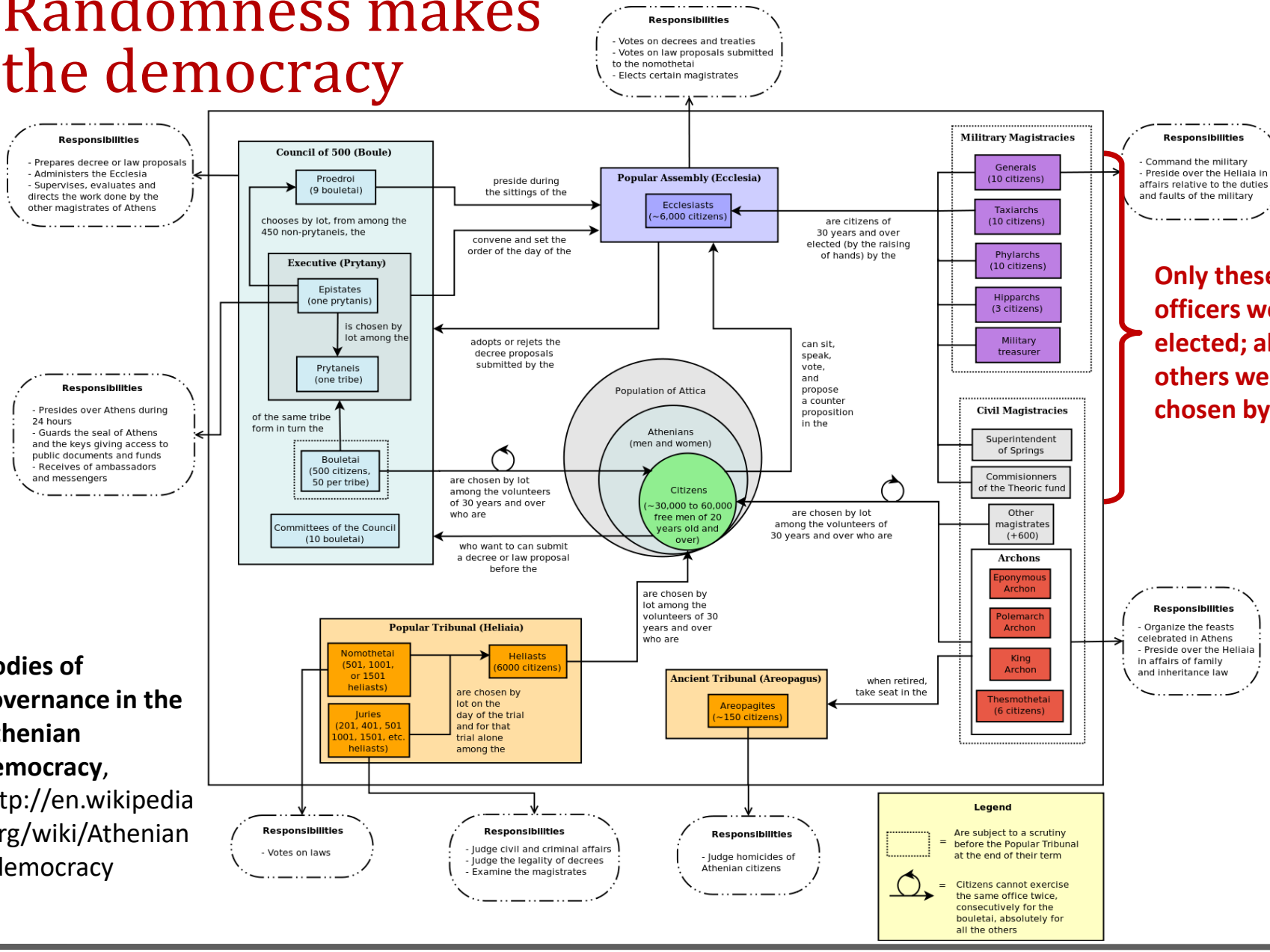
From the almighty determinism of the 17th century to the probabilistic world of the 20th century

- **Statistical physics** used the probabilistic concept of entropy (which is nothing other than a quantified measure of uncertainty defined within the probability theory) to explain fundamental physical laws (most notably the Second Law of Thermodynamics), thus leading to a new understanding of natural behaviours and to powerful predictions of macroscopic phenomena
- **Dynamical systems** theory has shown that uncertainty can emerge even from pure, simple and fully known deterministic (chaotic) dynamics, and cannot be eliminated
- **Quantum theory** has emphasized the intrinsic character of uncertainty and the necessity of probability in the description of nature

From the almighty determinism of the 17th century to the probabilistic world of the 20th century (contd.)

- Developments in **mathematical logic**, and particularly **Gödel's incompleteness theorem**, challenged the almightiness of deduction (inference by mathematical proof)
- Developments in **numerical mathematics** highlighted the effectiveness of stochastic methods in solving even purely deterministic problems, such as **numerical integration** in high-dimensional spaces and **global optimization** of non-convex functions (where stochastic techniques, e.g. evolutionary algorithms or simulated annealing, are in effect the only feasible solution in complex problems that involve many local optima)
- Advances in **evolutionary biology** emphasize the importance of stochasticity (e.g. in selection and mutation procedures and in environmental changes) as a driver of evolution

Randomness makes the democracy



Bodies of governance in the Athenian democracy, http://en.wikipedia.org/wiki/Athenian_democracy

Basic principles of the Athenian democracy that substantially differ from those in modern ones

- It was a direct (participatory) democracy, very different from modern representative democracies
- Randomness (in the selection of officers by sortition, aka allotment, demarchy, stochocracy) is most important because:
  - It makes possible participation of all citizens, discouraging development of an elite (class politique)
  - It makes citizens responsible for their fate
  - It makes the governance difficult to manipulate
- It was based on a simple and clear principle of inclusion:
  - The rights arise from the fulfilment of obligations

Conclusions

- AK has been full of refreshing ideas, at the same time being an old-fashioned gentleman
- Nonetheless, in an era where novelty and innovation have been deified, it is quite important to be a little bit old fashioned
- Modern ideas are not necessarily closer to truth or to perfection than older ones:
  - Einstein's world view was not necessarily closer to truth than that of Newton – let alone Heraclitus
  - Modern democracies are undoubtedly inferior to the ancient Athenian democracy
- Current "Greek democracy" sounds like a short joke; deterministic predictions of the future of Greece are despairing
- However, the inherent randomness of the world allows hope and optimism

Epilogue (just for provocation)

- In 1927, **Werner Heisenberg** published his **uncertainty principle**, expressing the limitations of predictability in the quantum world
- In 1930, **David Hilbert** pronounced his aphorism "Wir müssen wissen, wir werden wissen" ("**We must know, we will know**")
- Hilbert did not know that the day before, **Kurt Gödel** had announced his **incompleteness theorem** thus having killed Hilbert's dogma
- 80+ years after, climate-change-ologists, their politico-economic masters and their servants, including hydrologists, have advanced the dogma "We must know, we will know" to "We must know, we know" (in particular, we know the future, which of course will be a hell)
- 2300+ years ago, Epicurus pronounced science as the enemy of fear
- Uncertainty is not an enemy; rather this world is livable *because of it*

Θέλω να ζω,
Τις προβλέψεις ν' αναιρώ

I like to live,
The predictions to deceive

From the theater play "Τι θα κάνουμε τώρα;" ("What shall we do now?") by D. Kouroumbalis and the youngsters' theater team So7 (Ερευνητικό Θέατρο, Athens, Greece, 2011); transliteration into English by D. Koutsoyiannis