

Background

Since 1975, I have worked with education and research within the field of *Energy and Environmental science*. During 1975-89 at Göteborg University (GU) and Chalmers University of Technology (CTH), 1989-93 at Mälardalen University, 1993-95 at Karlstad University, 1995-96 Kristianstad University and from 1995 mainly within the UNESCO project the *Encyclopedia of Life Support Systems*. Since 1976 I am also a consultant, and I have had contracts with Volvo, Göteborg Energi, ABB, Alstom and others. For many years 2000-08 I manage a 200 hours course on Sustainable Energy Systems/Renewable Energy, at the University of Gävle, in 2007 I manage a 200 hours course on Wind power at Halmstad University and from July 2008 I hold a position at Gotland University as Professor of Energy engineering.

In 1975 I began my research studies on *Environmental science* under the supervision of Prof. Karl-Erik Eriksson at GU and CTH. Besides, broadening my competence by courses as *Ecological and Resource Economics* about 30 U (Units)¹, *Human Ecology* 20 U and *Natural Resources* 10 U, I worked with developing and managing new courses, e.g., *Natural Resources and Society* 2.8 U, *Energy Physics* 2.8 U and *Energy and Economizing* 20 U² at CTH and *Energy and Future* 20 U at GU. My pioneering work later lead to the establishment of the Department of Physical Resource Theory at GU and CTH that today holds a number of Professors and research students. I plaid an active role in this process of establishing a new research department. I was also heavily involved in the establishment of new courses and educational programs.

In 1977 I wrote a pioneering paper [Exergy - a useful concept within resource accounting](#) that still is being cited frequently in the literature³. During 1978-80 I was assigned Assistant Professor at the Center of Energy Technology and the Department of Theoretical Physics at CTH.

In 1982 I became Licentiate of Science with my work: *The Concept of Exergy Applied to the Resource Conversion in the Society*.

During 1982-83 I was with the Center for Advanced Engineering Study at Massachusetts Institute of Technology (MIT) under the management of Prof. Myron Tribus, by the support from the International Institute for Applied Systems Analysis I studied *Thermoeconomics* as a method to optimize the resource use of technical systems and the work on quality management of W. Edwards Deming.

Since 1984 I have lead a number of research projects with support from, e.g., National Board of Technological Development (Styrelsen för teknisk utveckling, STU), Energy Research Council (Energiforskningsnämnden, EFN), Research Council (Forskningsrådsnämnden, FRN), Building Research Council (Byggforskningsrådet, BFR), Swedish National Energy Administration (Energimyndigheten, STEV), Swedish National Board for Industrial and Technical Development (NUTEK) and Uppsala University.

In 1986 I received my Ph.D. in Physical Resource Theory with the thesis *Exergy — a Useful Concept*, (<http://ex->

<http://ex->ergy.se) which treats fundamental concept and methods for a sustainable society.

For about 2 years, during 1987-89, I was Guest Researcher at Research Laboratory of Resources Utilization, Tokyo Institute of Technology. My stay in Japan also led to good contacts at Canon Research Center and at National Institute of Science and Technology Agency. By funding from the Ministry of International Trade and Industry (MITI) I was at the National Institute for Resources and Environment (NIRE) for three month in 1995.

In 1992 I was project manager and chairman of a seminar on Japanese management at “Tekniska Veckan” and I have also participated in radio programs about Japan. I have also supervised a number of MSc, one PhD in Japan and two PhD in Sweden.

Since 1995 I am Associate Professor (Docent) in Physical Resource Theory at CTH and GU. In 2008 I earned a Master of Education at Göteborg University.

I am often engaged in international activities: Session Chairman and Keynote speaker at a number of conferences, Reviewer at *Energy – the International Journal*, listed in *Who's Who in the World*, member of *American Society of Mechanical Engineering*, *International Association For Energy Economics*, *The E-Group* and since 1999 Member of the *UNESCO-EOLSS Joint Committee*. I am also often engaged as reviewer for journals and conferences.

I was keynote speaker on “Global exergy analysis of societal systems” at “The Third Gordon Research Conference”, keynote speaker at “ECOS'99 - International Conference on Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems” in Tokyo, where I also chaired a two hours “Round Table Discussion” on “Future Research of Exergy and Its Application”, and keynote speaker at the 2nd International Exergy, Energy and Environment Symposium, 2005, Greece. In 2003 I was awarded lead author of the *Encyclopedia of Earth*⁴. In 2005 I was member of the Doctoral Examination Committee for M.B. Goncales Castro, “Design for Resource Efficiency”, Design for Sustainability group, Delft University of Technology in The Netherlands. In 2006 I was inaugural speaker at the 8th Liege Conference, Belgium. In 2008 I was invited speaker at Universidad Industrial de Santander of Colombia's “60 years anniversary” and in 2009 I was keynote speaker at the ACOFI National Meeting and Engineering Expo in Colombia where I addressed the need for a stronger focus on sustainable development in engineering education. This issue I also addressed in my paper “On Physics and Engineering Education in Sustainable Development” at the International Conference on Engineering Education in Sustainable Development in Göteborg, Sweden September, 2010.

Scientific experience

My research area may be divided accordingly:

Exergy based concepts, tools and methods^{5 6 7 8} applied to natural and social resource conversion systems in

⁴ <http://www.eoearth.org/article/Exergy>

⁵ G. Wall, “*Exergy a Useful Concept within Resource Accounting*” Report No. 77-42, 58 p., Chalmers, 1977.

⁶ G. Wall, *Exergetics*, 145 p, outline of a textbook on exergy, frequently updated, <http://www.exergy.se/ftp/exergetics.pdf>

⁷ G. Wall, “*Exergetics*” in *EOLSS Our Fragile World*, Ed. M.K. Tolba, Eolss Publishers, Oxford, ISBN 0-9534944-7-0, 2001.

¹ 1 Unit is equal to 1.5 ETCS or 1 week of studies, i.e. about 40 hours.

² Newspaper article in *Arbetet* 1979-06-27 titled: “Helt unik kurs på Chalmers - Här utbildas landets första energiplanerare”

³ SCOPUS indicates in October, 2010 over 15 citations in 2010 for this article that is more than 30 years old.

order to increase efficiency and robustness. A chapter on Exergy appeared in the Encyclopedia of Energy¹ and a historical survey of over 2600 commented exergy references up to 2004 was recently presented². My early work on exergy and exergy application, e.g., my thesis from 1986 *Exergy – A Useful Concept* is still gaining increasing attention in the literature. Presently, I offer a number of exergy courses at Gotland University, *Exergy, Exergy Analysis* and *Exergy Economics*, with a very good feedback from the students.³

Natural resource use in the society towards sustainable development^{4 5 6} By applying physical concepts as exergy to the total resource conversion system of the society, possibilities to improve the efficiency and to reduce the environmental impact are revealed.⁷

This has been done for Sweden; the years 1920, 1975, 1980, 1987 and 1994, Ghana 1975, Japan 1985, Finland 1985 and Italy 1990.^{8 9} These studies point out a number of possible improvements to be made, still. Recently similar studies of Norway and China have appeared in the literature.

From these works I have also proposed an exergy tax, which has gained some general interest.¹⁰ This tax would strongly promote the development towards a sustainable, or rather vital, society.

Economic optimization of resource conversion systems, by which the total cost is minimized, subject to technical, ecological and legal conditions, and during operation, which is unique.¹¹ Thus, technical processes can be cost effective under prevailing external conditions. Together with sensitivity analysis the process may be designed to meet or even go ahead of future restrictions.

⁸ G. Wall, "Exergy Tools" in *Proceedings of the I MECH E Part A Journal of Power and Energy*, Vol. 217 pp. 125-136, 2003.

¹ G. Wall, "Exergy" in *Encyclopedia of Energy*, Academic Press, 2004.

² E. Sciubba & G. Wall, "A Brief Commented History of Exergy from the Beginnings to 2004". *Int. J. of Thermodynamics*, Vol.10 (No1) pp.1-26, March 2007

³ <http://www.exergy.se/goran/orig/ex09.pdf>

⁴ "Sustainable Society", Report to the local government (Kretslopp i översiktsplanen, Översiktsplan för Göteborg, Planeringsunderlag 2:92, Stadsbyggnadskontoret).

⁵ Wall, G. "Exergy and a holistic view - an application to the city of Göteborg", *Exergi och helhetssyn – en tillämpning på Göteborg*, Översiktsplan för Göteborg, Underlagsmaterial 6:92, Stadsbyggnadskontoret och Göteborg Energi AB (1992), http://exergy.se/ftp/exo_helgot.pdf.

⁶ Wall, G. "Exergy, a holistic view and intelligence - an application to the city of Västerås", *Exergi, helhetssyn och intelligens – en tillämpning på Västerås*, rapport 716-005 STEV och Opuscula #6 MH, 1992, exergy.se/ftp/exvasteras.pdf.

⁷ G. Wall, M. Östlund "Exergy and energy conversions in the city of Göteborg in 1991", "Exergi- och energiomsättningen i Göteborgs kommun 1991", Göteborg Energi AB (1993).

⁸ A number of papers, see my curriculum vitae.

⁹ G. Wall, "The Use of Natural Resources in Society" in *EOLSS Our Fragile World*, Ed. M.K. Tolba, Eolss Publishers, Oxford, ISBN 0-9534944-7-0, pp. 209-230, 2001.

¹⁰ G. Wall, "An Exergy Tax", "2nd European Congress on Economics and Management of Energy in Industry", April 5-9, 1994, Estoril, Portugal.

¹¹ G. Wall, "Optimization of Refrigeration Machinery", *International Journal of Refrigeration*, Vol. 14., s. 336-340, 1991.

Together with Dr. Mei Gong I have worked out a new method, **Life Cycle Exergy Analysis (LCEA)**¹², based on Exergetics, Energy Analysis and Life Cycle Analysis. This method is further developed and shown to be a useful tool in the design of sustainable energy systems and is gaining an increased interest.¹³

Tepidology – to maintain systems close to ambient conditions is an important research field that I have introduced.¹⁴ Recently this early work is being recognized in the new growing research field *Low Exergy Systems for High Performance Buildings and Communities*¹⁵. My studies have indicated large possibilities for improvements.¹⁶

Combustion without emissions – for a number of years I collaborated with Prof. Eugene Yantovskii on sustainable energy systems, e.g. combustion processes without emissions based on CO₂ cycles (OCDOPUS-project), i.e., energy systems based on fossil fuels with no emissions.^{17 18 19 20 21}

An **expert system** based on the exergy concept, called EUD (Energy Utility Diagrams) has been developed by Prof. Masaru Ishida at TIT. This method is a useful tool in the structural design of complex energy systems, since it indicates the exergy losses in the process. The method is superior to the more adopted **Pinch technology**, since

¹²M. Gong & G. Wall, "On Exergetics, Economics and Optimization of Technical Processes to Meet Environmental Conditions", presented at TAIES'97, June 10-13, 1997, Beijing, China, publ. Ruixian Cai, et al. Eds., *Thermodynamic Analysis and Improvement of Energy Systems*, pp. 403-413, Beijing World, ISBN 7-5062-3264-Z.

¹³G. Wall, "Conditions and Tools in the Design of Energy Conversion and Management Systems of a Sustainable Society" *Energy Conversion and Management*, Vol. 43, No. 9-12, pp. 1235-1248, 2002.

¹⁴G. Wall, "Exergy Needs to Maintain Real Systems Near Ambient Conditions", "Florence World Energy Research Symposium", 28 Maj-1 Juni, 1990, Florence, Italy, S. S. Stecco, M. J. Moran red., *A Future for Energy*, s. 261-270, Pergamon.
¹⁵<http://www.ecbcs.org/annexes/annex49.htm>

¹⁶G. Wall, H. Cardfelt "Exergy Study of a Food Industry", "Exergistudie för Slakthusets industriområde i Göteborg", Report for the GE, 1988.

¹⁷E. Yantovskii, G. Wall, L. Lindquist and J. Tryggstad, "Exergonomics of the Ocdopus Project", *Energy Convers. Mgmt*, Vol. 34, No. 9-11, pp. 1213-1218 (1993).

¹⁸E. Yantovskii, G. Wall, L. Lindquist and J. Tryggstad, "Oil enhancement Carbon Dioxide Oxygen Power Universal Supply", *Energy Convers. Mgmt*, Vol. 34, No. 9-11, pp. 1219-1227 (1993).

¹⁹E. Yantovskii, G. Wall, L. Lindquist, J. Tryggstad, R.A. Mak-sutov, K.N. Zvaglovksy and V.A. Gavrilenko, "OCDOPUS project—Oil Enhancement Carbon Dioxide Oxygen Power Universal Supply", *FLOWERS—Florence World Energy Research Symposium*, July 6-8, 1994, Italy (1994).

²⁰E. Yantovskii, G. Wall, L. Lindquist and J. Tryggstad, "Exergonomics an EOR (OCDOPUS) Project", *ENERGY*, Vol. 19, No. 12, pp. 1275-1278 (1994).

²¹G. Wall, E. Yantovskii, L. Lindquist & J. Tryggstad, "A zero emission combustion power plant for enhanced oil recovery", *ENERGY*, Vol. 20, No. 8, pp. 823-828 (1995).

it is not limited to heat exchangers^{1 2}. I have applied EUD to the **Kalina-cycle**³ in order to point out further possible improvements.⁴

I am also proposing more efficient use of **biofuels**, in production⁵ and in processing of forest products⁶.

1995-98 I was engaged in a joint project with Swedish University of Agricultural Sciences⁷ and Chalmers to develop more **efficient transportation systems**,⁸ and Dr. Magnus Blinge, whom I supervised, developed the Energy Logistic Model.

Human Ecology and Recycling Engineering: The autumn of 1993 I was substituting Prof. Nils Tiberg at the Department of Waste Management and Recycling (RPT, www.sb.luth.se), Luleå University of Technology. Besides conducting a graduate course, *Exergy and Environment 6 U*, I also completed a report on principles of a sustainable society.⁹

Environmental Management Systems (EMS): Through a series of articles, radio programs and confer-

ences I have introduced **Total Resource Management**.^{10,11,12} Since 2008 I offer an online course on *EMS* at Gotland University with a very good response from the students¹³.

The Editor in Chief of EOLSS (eolss.net), Dr. Al-Gobaisi, made the following statement about my work: "I found it to be an exemplary and educative paper, and most important for the welfare and future of mankind and his biosphere. Its macro-concepts for sustainable developments were points that caused much thought, re-evaluation and discussion."

Desalination: Commissioned by EOLSS I have done an exergy study of desalination techniques published in the Encyclopedia of Desalination and Water Resources (DESWARE, www.eolss.co.uk/desal).¹⁴

More and more I emphasize on **ethics and morals** as being the basis of sustainable development,¹⁵ which rendered me candidate of the prestigious "Sir Ratan Tata Visiting Fellowship". (However, from personal reasons I had to decline.)

Industrial Ecology and Education for Sustainable Development are new areas that relates to most of my work.^{16 17 18}

Education and Sustainable Development is a topic that I have focused more on during the recent years mainly due to its importance for the industrial society and the conditions for a sustainable development. Still most

¹ G. Wall & M. Gong, "Heat Engines and Heat Pumps in Process Integration", presented at the Symposium on Thermodynamics and the Design, Analysis, and Improvement of Energy Systems, November 12-17, 1995 at ASME WAM '95, San Francisco, California, publ. R.J. Krane Ed. AES-Vol. 35, pp. 217-222.

² G. Wall & M. Gong, "Exergy Analysis versus Pinch Technology", presented at ECOS'96, Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems, June 25-27, 1996, Stockholm, Sweden, publ. P. Alvfors et al Eds., ISBN 91-7170-664-X, pp. 451-455.

³ Wall, G., Chuang, C.-C., Ishida, M., "Exergy Study of the Kalina Cycle", "1989 ASME Winter Annual Meeting", 10-15 Dec., 1989, San Francisco, California, R. A. Bajura, M. R. von Spakovsky and E. S. Geskin Eds., *Analysis and Design of Energy Systems: Analysis of Industrial Processes*, AES-Vol. 10-3, s. 73-77, ASME (1989).

⁴ C-C. Chuang, G. Wall and M. Ishida, "Graphic Exergy Analysis of the Kalina Power Cycles", presented at "International Conference on the Analysis of Thermal and Energy Systems", 3-6 June, 1991, Athens, Greece, Opuscula No. 1, ISSN 1102-0385, MH (1991).

⁵ K. Hovelius & G. Wall, "Energy, Exergy, and Emergy Analysis of a Renewable Energy System Based on Biomass Production", presented at ECOS'98, Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems, July 8-10, 1998, Nancy, France, publ. A. Bejan et al Eds., ISBN 2-905-267-29-1, pp. 1197-1204.

⁶ R. Renström & G. Wall, "Exergy Analysis of a Back Pressure Turbine and a Back Pressure Superheated Steam Dryer of a Sawmill Industry", presented at ECOS'98, Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems, July 8-10, 1998, Nancy, France, publ. A. Bejan et al Eds., ISBN 2-905-267-29-1, pp. 235-242.

⁷ <http://www.slu.se/>

⁸ G. Wall, "Exergy Use in the Swedish Society 1994", report CTH and SLU, 36 p. (1996)

⁹ G. Wall, "Exergy, Ecology and Democracy, Tools in a Sustainable Society" ("Exergi, ekologi och demokrati. Redskap i ett kretsloppssamhälle"), RPT, Luleå University of Technology, ISBN 99-1973736-4, 45 p. (1994)

¹⁰ G. Wall, "The Japanese worker is involved" ("Japanske arbetaren är delaktig"), *Göteborgs-Posten*, 12 December, 1991, G. Wall, "Allow the Japanese to build cars in Sweden" ("Låt japanerna bygga bilar i Sverige"), *Ny Teknik • Teknisk Tidskrift*, No.1-3, 1992 and G. Wall, "Do as Japan – learn from Deming!" ("Gör som Japan — lär av Deming!"), *Ny Teknik • Teknisk Tidskrift*, nr 12, 1992, Sveriges Radio P1 Direkt 920203 and Tekniska Veckan 92, *Göteborgs-Posten*, 12 December, 1991

¹¹ G. Wall, "Quality — a matter of Exergy, Ecology and Democracy", presented at "Kvalitet i kommuner och landsting", 23-24 November, 1993, Göteborg, Sweden.

¹² G. Wall, "Exergy, Ecology and Democracy — Concepts of a Vital Society", presented at "ENSEC'93 International Conference on Energy Systems and Ecology", 5-9 July, 1993, Cracow, Poland, publ. in Szargut, J., et al., Eds., pp. 111-121 (1993).

¹³ <http://www.exergy.se/goran/orig/ems09.pdf>

¹⁴ G. Wall & M. Gong, "On Exergetics, Economics and Desalination", in DESWARE, EOLSS, UNESCO, 2001.

¹⁵ G. Wall, "Energy, Society and Morals", *Journal of Human Values*, vol. 3, no. 2, Sage Publications New Delhi/Thousand Oaks/London, pp. 193-206 (1997).

¹⁶ G. Wall, "The Life Support Systems and Sustainable Development" in *EOLSS Our Fragile World*, Ed. M.K. Tolba, Eolss Publishers, Oxford, ISBN 0-9534944-7-0, 2001.

¹⁷ G. Wall, "Exergy and Life Support Systems" in *Knowledge Base for Sustainable Development - An Insight into the Encyclopedia of Life Support Systems*, UNESCO Publ./EOLSS Publ., Oxford, ISBN UNESCO 92-3-103860-5, pp. 403-417, 2002.

¹⁸ G. Wall, "Engineering Sustainability", inaugural pres., 8th Liège Conf., Belgium 2006, *Materials for Advanced Power Engineering 2006*, 18-22 Sep 2006, Liège, Belgium, publ. J. Lecomte-Beckers et al Eds., ISBN 3-89336-436-6, pp. 5-24, 2006.

of higher education is obsessed with teaching non sustainable development.^{1 2 3}

Pedagogical experience

Joy in learning, is essential. The educational system must learn from TQM (Total Quality Management): *The teacher's job has changed. The student work in a system. The job of the teacher is to work on the system to improve it, with their help.* Understanding is crucial, and so is to learn to learn and to think and to work independent and responsible. My vision is a school completely ruled by the students. I regard them as responsible and committed to learning. Some of these ideas I practiced at Mälardalen University (MDH) with a strong support from the students.⁴

I have participated in a number of short pedagogical courses, I have learned most about teaching as a student myself and from my colleagues. However, Prof. Myron Tribus has been a good teacher also in this regard.

Together with my students I have tested new ways of teaching, from PBL and beyond, in order to improve learning. Besides, I have learned a lot from my visits at universities in Europe, USA, Japan, Russia, China, Italy and Colombia.

During the years I have been engaged in a countless number of pedagogical activities, such as editor, teacher, evaluator, consultant, debater and expert at schools, universities, conferences, newspapers, radio and TV. My students have been from all ages and from most different backgrounds. For a number of years I was engaged in an international summer course: *Energy Planning and the Environment* at the University of Oslo (<http://www.uio.no/iss>). In total I have been lecturing for well over 10000 hours, developed courses of more than 100 U and written more than 1000 pages of compendiums. My homepage on Internet is also an important educational asset, with on a daily basis more than 200 unique visitors that download about 150 MB (<http://www.exergy.se/logs>). My site is approved by the Intute⁵, <http://www.intute.ac.uk/> and linked to from numerous web pages. My site is highly appreciated as a source of knowledge by many researchers and students all over the world.

1998-2001 I gave courses at the Curt Nicolin College on alternative energy systems (<http://www.exergy.se/goran/swedish/cng/alten/>) and exergy and the principal evaluated my work accordingly: *Göran is very engaged in the pedagogues of teaching and has been one of my sources*

¹ G. Wall, "On Physics and Education for Sustainable Development", Nov 20-22, 2009, Penang, Malaysia, 3rd Int Conf Higher Educ on Sust Dev.

² G. Wall, "On Exergy and Sustainable Development in Environmental Engineering", *The Open Env. Eng. J.*, vol. 3 pp. 21-32.

³ G. Wall, "On Physics and Engineering Education in Sustainable Development", Sep 19-22 Göteborg, Sweden, Int Conf Eng Educ in Sust Dev, <http://eesd10.org>.

⁴ Article in Vestmanlands läns tidning 910308: "De lär sig förebygga framtida miljöproblem", <http://exergy.se/goran/swedish/artiklar/em.html>.

⁵ Intute ... to the very best Web resources for education and research. The service is created by a network of UK universities and partners. Subject specialists select and evaluate the web-sites in our database and write high quality descriptions of the resources.

of inspiration developing a modern school. I also know Göran as an intellectual opponent in discussions about the future of my school. For several years 2000-08 I gave a course on sustainable energy systems at the University of Gävle, (<http://www.exergy.se/goran/hig/re/index.htm>) and in 2007 I offered the course Wind power at Halmstad University. 2005-2006 I taught *Physics and Theory of Knowledge* at the International Baccalaureate School (www.ibo.org), Kungsbacka, Sweden and was qualified as an *ambitious* teacher by the principal. In 2008 I earned a Master degree in Education at GU⁶ with the thesis [On Education towards Sustainable Development](#). Since 2008 I have taught a number of on line courses on exergy and environment as Exergy Analysis, Environmental Management Systems and Energy and Environment at the department of Culture, Energy and Environment, Gotland University.

Earlier evaluations of my work

In 1994 I was assigned qualified of a professorship in Human Ecology by Prof. Bengt Hubendick and Prof. Torsten Malmberg (University of Göteborg, January 18, 1994, Ref. E 311 525/92):

- T. Malmberg, Jan. 10, 1994: "Doubtless these works are of great interest for human ecology ... It is quite evident that Göran Wall is a world leading expert ...".
- B. Hubendick, Dec. 31, 1993: "Göran Wall has accomplished excellent achievements within the resource theoretical field."

In 1998 Prof. Björn Kjellström, Dept. Mech. Engineering, Luleå University of Technology, gave me the highest score⁷ for a full professorship in Energy Engineering.

Prof. Ann-Mari Jansson, Dept. of System Ecology (<http://www.ecology.su.se/>), Stockholm University, made the following statement regarding an assistant professorship in Environmental Engineering:⁸

"Wall successfully manages to join theory, technology and society in an excellent way. ... My conclusion is that Wall is a very dynamic teacher and researcher who is well qualified for the assistant professorship. He is obviously superior to the other candidates."⁹

At a position as assistant professor in Environmental Science at Karlstad University I was ranked first by Prof. Lars B. Johansson (larjo@ifm.liu.se) and Prof. Alexander Lauber. They made the following evaluation of my lecture on LCA: "Wall's lecture showed an excellent ability to visualize the subject to the audience, ..." ¹⁰ and "Regarding education every teacher knows than pedagogical experience is not enough. You also need the 'divine gift'. This is why you arrange test lectures. At the lectures for this position Wall was by far the best."¹¹

⁶ <http://www.exergy.se/goran/orig/lararexamen.jpg>

⁷ Ref. No. 470/98, Mälardalen University, Sweden.

⁸ Ref. No. 211-178/98, University of Dalarna, Sweden.

⁹ "Wall lyckas i sin forskning förena teoretisk underbyggnad, teknisk tillämpning och samhällsnytta på ett sällsynt bra sätt. ... Mitt samlade omdöme är att Wall är en mycket dynamisk lärare och forskare vars kvalifikationer för lektoratet i miljöteknik inte kan ifrågasättas. Jag anser honom meritmässigt klart överlägsen de övriga kandidaterna till tjänsten."

¹⁰ Prof. Lars B. Johansson: "Walls föreläsning visade dessutom en god förmåga att levandegöra ämnet för åhöraren, ..."

Prof. Anders Almquist (SLU) ones wrote to me after my lecture: “The students thought your lecture was ‘super’. I assume they mean that it was very good.”¹¹

Ass. Prof. Bernt Landström, Prefect at KAU, evaluated my work accordingly: *Wall performs his work with authority and independence. His ambition to stimulate and engage the students was expressed in many way, e.g., by seminars, mostly appreciated by the students. His scientific competence in the relevant field of science is very large, which was obvious since he was also appointed Associate Professor during his stay with us and that he was often engaged as speaker and chairman at international conferences.*

Wall’s working capacity is very large which is obvious from his list of publications.

As a person Wall is humble and understanding and at the same time fearless and open-minded in his communication. He is also demanding which often led to improvements of the organization, ...

*From his high scientific competence and his international contacts Wall has during his stay considerable contributed to the development of the department.*²

In 2007 I was considered for a professorship in Renewable Energy at Halmstad University (Ref. No. 473-06) by Prof. Mats Leijon³ “Göran Wall has an impressive list of publications of both peer reviewed papers and international conference contributions within the subject. GW is Docent at Chalmers, which scientifically more than well qualifies him for a professorship in the subject”. In 2008 I was qualified as professor of Energy and Environmental engineering at Swedish University of Agricultural Sciences by Prof. Björn Zethraeus⁴ (Ref. No. 1793/07) “In

¹¹Prof. Alexander Lauber: “Emellertid: när det gäller undervisning vet varje erfaren lärare att det ej räcker med pedagogiska meriter. Man måste även ha ‘den gudomliga gnistan’. Det är därför man anordnar provföreläsningar. Vid provföreläsningarna för denna tjänst visade Wall sig vara den överlägsne.”

¹ “Studenterna tyckte att dina föreläsningar var ‘en höjddare’. Jag förmodar att därmed menas att det var jättebra.”

² “Walls sätt att genomföra sina arbetsuppgifter präglades av stor auktoritet och självständighet. Hans ambition att stimulera och engagera studenterna tog sig många uttryck, exvis i form av seminarier etc., ofta uppskattade av studenterna. Hans vetenskapliga kompetens inom aktuellt kunskapsfält är mycket stort vilket bekräftas av att han förklarades docentbehörig under tiden för anställningen vid Högskolan och att han flitigt engagerades som föreläsare vid internationella konferenser och i konferensledning.

Walls arbetskapacitet är mycket stor vilket hans omfattande publikationslista vittnar om.

Wall som person är ödmjuk och förstående samtidigt som han är orädd och rättfram när han framför sina synpunkter. Han ställer även krav på sin omgivning, ...

Wall har med sin mycket stora vetenskapliga kompetens och breda internationella kontaktnät under sin anställning i hög grad bidragit till verksamhetens utveckling.”

³ “Göran Wall har en imponerande publikationslista av både peer reviewed litteratur och internationella konferensbidrag inom ämnet. GW är docent vid CTH, vilket vetenskapligt mer än väl både kvalificerar honom som professor inom ämnet.”

⁴ “Sammanfattningsvis bedömer jag Wall – huvudsakligen på basis av hans ämnesmässiga bredd men därutöver på hans erfarenhet av undervisning på grundnivån samt på basis av

conclusion I find Wall – basically from his wide competence in the subject and in addition his experience of education on fundamental level and his experience as supervisor – to be qualified as professor”.

Recently my qualifications as Professor of Energy Engineering at HGO is being reviewed by Prof. em. Bo Leckner⁵ and Prof. Signe Kjelstrup: Wall’s work shows a creativity and quality that does not leave doubts if he is scientifically qualified.⁶

My courses at Halmstad University and Gotland University has been highly appreciated by the students and are ranked well over average.⁷

Impact factor of my scientific work

One of my first scientific publications from 1977 G. Wall, “Exergy a Useful Concept within Resource Accounting,” Report No. 77-42, Institute of Theoretical Physics, Göteborg has gained a strong response from the scientific community and is still one of my most cited works, with over 15 citations so far in 2010. It is of course very encouraging that my early work presently is gaining such impact in the scientific community. Being sole author to most of my publications I still score a Hirsch’s h-index of >15 on Google Scholar (<http://www.exergy.se/ftp/googlescholar.pdf>) and >12 on Scopus (<http://www.exergy.se/ftp/scopus.pdf>) for only 16 of my publications.

Others

I support international work, as the *UNESCO-EOLSS project*, I feel a strong concern for morals, humans and scientific responsibility. I often have open lectures, debate articles, (<http://www.exergy.se/goran/swedish/artiklar>), and I have also been engaged by radio and TV. Recently, I published two popular science articles in a Swedish magazine on energy and environment engineering.⁸ Through Internet that I regard as the “classroom” of the future I have a constant interaction with people from all over the world. I was listed in *Who’s Who in the World 1995/96*. My homepage is well recognized on the Internet and used by many universities all over the world.

Since I am in favor of international collaboration I have sent a number of students abroad to complete their

hans handledarerfarenhet – som behörig att anställas som professor.” <http://www.exergy.se/goran/orig/prof1.pdf>

⁵ <http://www.exergy.se/goran/orig/prof2.pdf>

⁶ Walls arbeider vitner om en iderikdom og kvalitet som ikke levner tvil om han er vitenskapelig kvalifisert. <http://www.exergy.se/goran/orig/prof3.pdf>

⁷ Wind Power (<http://www.exergy.se/goran/orig/vind07.pdf>),

Environmental Management Systems

(<http://www.exergy.se/goran/orig/miljol08.pdf>,

<http://www.exergy.se/ftp/evalm109.pdf>,

<http://www.exergy.se/ftp/evalm10.pdf>) & Exergy

(<http://www.exergy.se/ftp/evalm09.pdf> & <http://www.exergy.se/ftp/evalm09a.pdf>).

⁸ 2008 G. Wall, “Livscykelxergianalys ett steg mot hållbar utveckling”, *Energi & Miljö*, Vol. 79, No. 3, pp. 54-76, 2008 <http://www.exergy.se/ftp/eom08.pdf>. 2007 G. Wall, “Räkna pengar inte mynt!”, *Energi & Miljö*, Vol. 78, No. 11, p. 52, 2007 <http://www.exergy.se/ftp/eom07.pdf>.

studies, e.g., Japan, Russia, USA, Austria and Italy as well as receiving students from abroad to study in Sweden.

It is very important with a good working atmosphere, that you always have time to share with your colleagues and students, and that TQM principles are practiced.

I like to teach, it is a creative process based on human interactions. With great satisfaction I have seen young students grow into competent graduates and responsible citizens.

As a scientist I have mainly worked on developing and introducing new concepts and methods to better describe, understand and improve the use of physical resources in the society with regard to the nature, i.e. a sustainable development. My concern for these issues influences most of my life.

Since 1976 I am running my consultant company with commissions from industry, e.g., ABB, Volvo and Göteborg Energy and educational organizations, e.g. UNESCO and many universities in Sweden and abroad.

Privately, I am engaged towards a more sustainable lifestyle. My house, from 1922, I have renovated into a modern, energy efficient and more environmental friendly, building, e.g., by 40 cm of insulation in the walls, 60 in the roof and solar panels, (<http://www.exergy.se/goran/swedish/artiklar>). A number of articles on my house have been published in house building magazines.⁸

Mölnådal November 1, 2010

⁸ (1) Thorsén, P., *Fakta om isolering*, Dec. 1987, (2) Wigartz, E., i *Mölnådalsposten*, 22 Jan., 1992, (3) Boström, H., *iDAG* 8 March, 1992, (4) Corneliussen, M. & von Porat, A., *Vårt Hus*, Aug., 1992, (5) Wilehag, L., *Villaägaren* nr No. 1 1993, (6) *Aktuell isolering*, Rockwool, 1993, (7) *Villatidningen* 1995 and (8) *Villa-Specialen* No. 1, 1995.