Professor Klaus Wyrtki and his key role in the Department of Oceanography

by Dave Karl, Departmental Colleague (1978-2013)
Professor Klaus Wyrtki: A role model for a young assistant professor, circa 1978

Klaus
Ph.D., 1950

Dave
Born, 1950
Take-home Messages

• Klaus was a thoughtful mentor and scholar
• Klaus was a world-class scientist and inspirational teacher
• Klaus was the “franchise”
A magnificent journey of the “grand old man” of physical oceanography from Kiel-Hamburg to Indonesia to Monaco to Australia to La Jolla to Hawaii

What he learned from his Ph.D.: *Look at large connections, not the details – integrate to see the big picture*

Klaus on science: *A prerequisite of scientific progress is that one is wondering… about something not easily explained and most progress is due to imagination and intuition*
The Role of Observations

Q: What are you most proud of?
A: The start of ocean monitoring…
You can’t believe the fights we had to get funding. I am very proud about the fact that I was involved in that, and was very vigorously participating in this fight.
Q: Following a brief discussion of data it was asked “Did you do any programming yourself?”

A: No, never!

Elaboration: At times I had up to four, five computer programmers working for me. I know what goes in and what comes out, but that was it. Like with an appendix. I don’t start to study medicine when I want my appendix out – I go to a doctor!
Q: Which are your favorite own publications?
A: “These are the thermohaline circulation (1961) and the $O_2$ minimum (1962)”
Klaus' contributions were fundamental
Global Patterns in Deep Water

- Nutrient (N&P) concentrations increase and oxygen decreases
- Water mass age increases!

Aerobic decomposition of organic matter
The oxygen minima in relation to ocean circulation

KLAUS WYRTKI

- Wyrtki (1962) – *a pioneering study*
- Karl et al. (1976) – *a test of in situ* 
  \(O_2\) *consumption hypothesis*

Adenosine triphosphate in the North Atlantic Ocean
and its relationship to the oxygen minimum

DAVID M. KARL,* PAUL A. LAROCK,† JOHN W. MORSE† and WILTON STURGES†

Fig. 1. Vertical distribution of selected chemical, biochemical and physical variables at the Mid-Atlantic Ridge station. A. ATP. B. Oxygen. C. Phosphate. D. Temperature. E. Salinity. F. Density.

Karl et al. 1976
Observed decreases in oxygen content of the global ocean

Kieran P. Helm,1,2 Nathaniel L. Bindoff,1,2,3,4 and John A. Church2,3

Received 15 September 2011; revised 25 October 2011; accepted 25 October 2011; published 2 December 2011.

[1] Comparing the high-quality oxygen climatology from the World Ocean Circulation Experiment to earlier data we reveal near-global decreases in oxygen levels in the upper ocean between the 1970s and the 1990s. This globally averaged oxygen decrease is $0.93 \pm 0.23 \, \text{mm} \text{ol} \, \text{l}^{-1}$, which is equivalent to annual oxygen losses of $0.55 \pm 0.13 \times 10^{14} \, \text{mol} \, \text{yr}^{-1}$ (100–1000 m). The strongest decreases in oxygen occur in the mid-latitudes of both hemispheres, near regions where there is strong water renewal and exchange between the ocean interior and surface waters. Approximately 15% of global oxygen decrease can be explained by a warmer mixed-layer reducing the capacity of water to store oxygen, while the remainder is consistent with an overall decrease in the exchange between surface waters and the ocean interior. Here we suggest that this reduction in water mass renewal rates on a global scale is a consequence of increased stratification caused by warmer surface waters. These observations support climate model simulations of oxygen change under global warming scenarios. Citation: Helm, K. P., N. L. Bindoff, and J. A. Church (2011), Observed decreases in oxygen content of the global ocean, Geophys. Res. Lett., 38, L23602, doi:10.1029/2011GL049513.

- Globally averaged loss of $O_2$
- Partly (15%) due to warming and stratification
- Few comprehensive time-series
KLAUS WYRTKI’S FORTY YEARS OF CONTRIBUTIONS TO OCEANOGRAPHY: HIS STUDENTS’ PERSPECTIVE

By Roger Lukas, William Patzert, Gary Meyers and William Emery

Abstract
Professor Klaus Wyrtki of the University of Hawaii was recently awarded the American Geophysical Union’s prestigious Maurice Ewing medal for his many contributions to oceanography. He was also honored by his students and colleagues with a day-long special symposium that focused on the major themes of his forty years of research in physical oceanography. In this article, four of his Ph.D. students summarize his distinguished career and important contributions to our understanding of the oceanic circulation and its interaction with the overlying atmosphere.
“Klaus Wyrtki is an oceanographer in the classical interdisciplinary sense ... providing the grand synthesis whenever possible, making pioneering new observations where data limitations are too great, and approaching his research with an understanding of meteorology and other disciplines.”

Lukas, Patzert, Meyers & Emery (1990)
Fellowship in Professional Societies


Elected member, American Academy of Arts and Sciences

- Established 1780
- Honors excellence and service to the nation and the world
- Science, business, public affairs, arts
- 1st class (1781) included Benjamin Franklin and George Washington
- Class of 2007 included Al Gore, Sandra Day O’Connor, Michael Bloomberg, Eric Schmidt and Klaus!
Klaus Wyrtki - 2004
Alexander Agassiz Medal
National Academy of Sciences

“for fundamental contributions to the understanding of the oceanic general circulation of abyssal and thermocline waters and for providing the intellectual underpinning for our understanding of ENSO (El Niño)”
Klaus Wyrtki: A “well decorated” scholar

Alexander Agassiz Medal
Est. 1911

- (1918) Prince Albert I of Monaco: Prince Albert I Medal (est. 2001) IAPSO, awarded to Klaus – 2003
- (1932) Albert Defant: Defant Medal of the German Meteorological Society, awarded to Klaus – 1992
- (1938) Harald Sverdrup: Sverdrup Medal (est. 1964) AMS:, awarded to Klaus – 1991
Economics, science and society are inextricably linked!

The “Larger Context” of Klaus’ Contributions
Nobel Prize-winning Take-home Message

AR-4
3,500 experts from 130 countries

IPCC-AR4
Warming in the climate system is unequivocal
REVIEW ARTICLE

Sea Level Rise: The Facts and the Future

KLAUS WYRTKI

ABSTRACT: Sea level records from the Pacific are analyzed to determine the rate of long-term sea level rise and its relation to climate change. The trend is largely dependent on vertical movements of the land on which the sea level gauges are located and varies from place to place. Other obvious contributions to sea level rise come from melting of glaciers, from global warming, and from sea floor spreading. Present rate of sea level rise is about 1 mm per year and is subject to a large uncertainty. Assumptions about global warming in conjunction with the greenhouse effect are critically reviewed to project possible rise of sea level in the next 50 yr. It is concluded that effects of a doubling world population within the next 40 yr will have much more disastrous consequences for our environment than potential rise of sea level.

"Sea level will be a picnic compared with the population explosion"

Wyrtki interview 1990
Klaus on Ending his Active Scientific Career

There is a time for everything. There is a time to be young... there is a time to work and to travel ... and there is a time to retire when you have earned it.

Why should we not quit one day and enjoy life?
The Klaus Chronometer

Creativity/Productivity

Getting Going (20-30)

Peak (40-50)

Consolidation and Integration (50-60)

RETIRE & ENJOY LIFE!

Age

20 30 40 50 60 70
Mahalo and Aloha
May you rest in peace