

# Chemicals and Health: Preventing Cancer through TUR

Dick Clapp

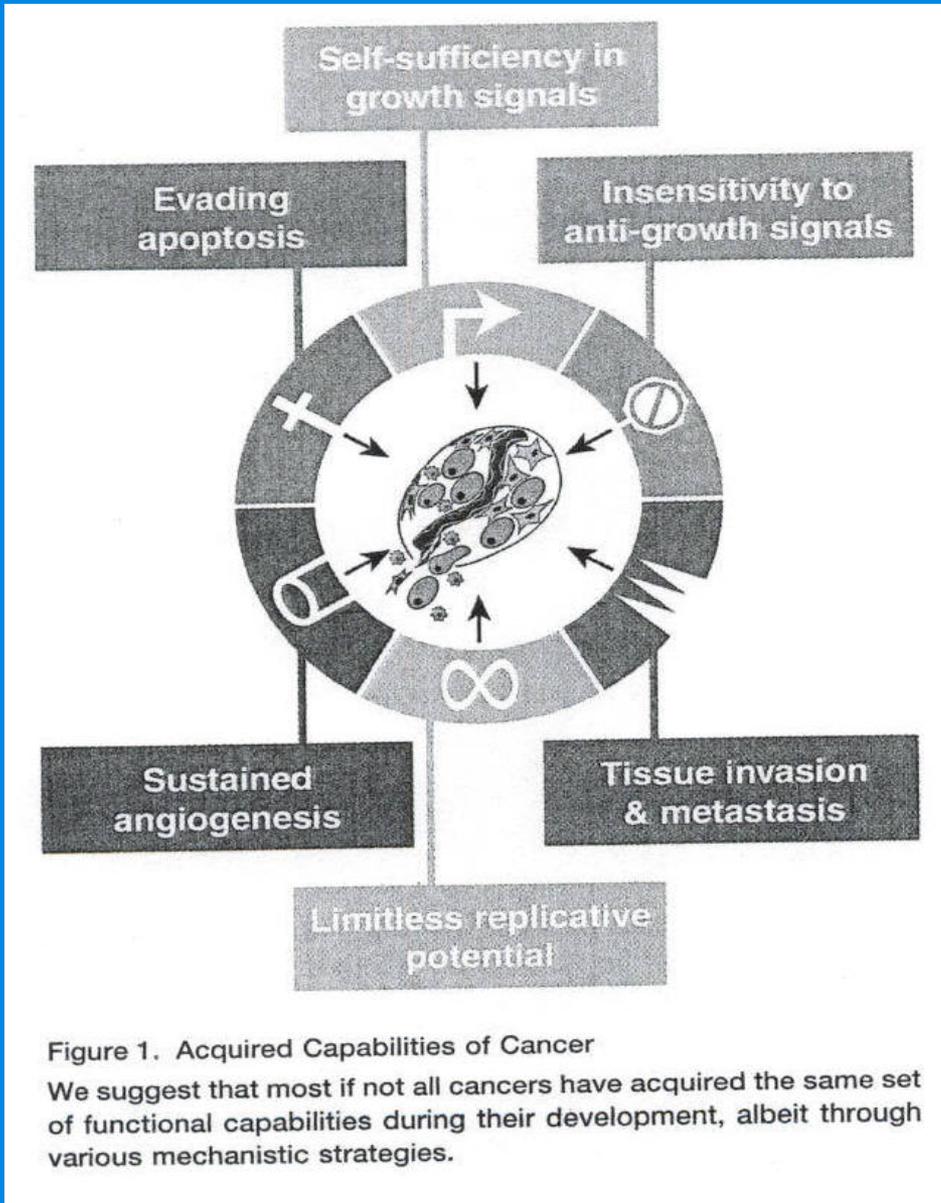
Lowell Center for Sustainable  
Production

November 13, 2012

# Outline of presentation

- Background on rates and causes of cancer
- Cancer as a “multi-factorial” disease
  - Opportunities for prevention
- Camp Lejeune water contamination and cancer studies
- President’s Cancer Panel report

# Current Mechanistic Understanding



Source: Hanahan D and Weinberg R. The Hallmarks of Cancer. Cell 2000;100:57-70

# Current Mechanistic Understanding

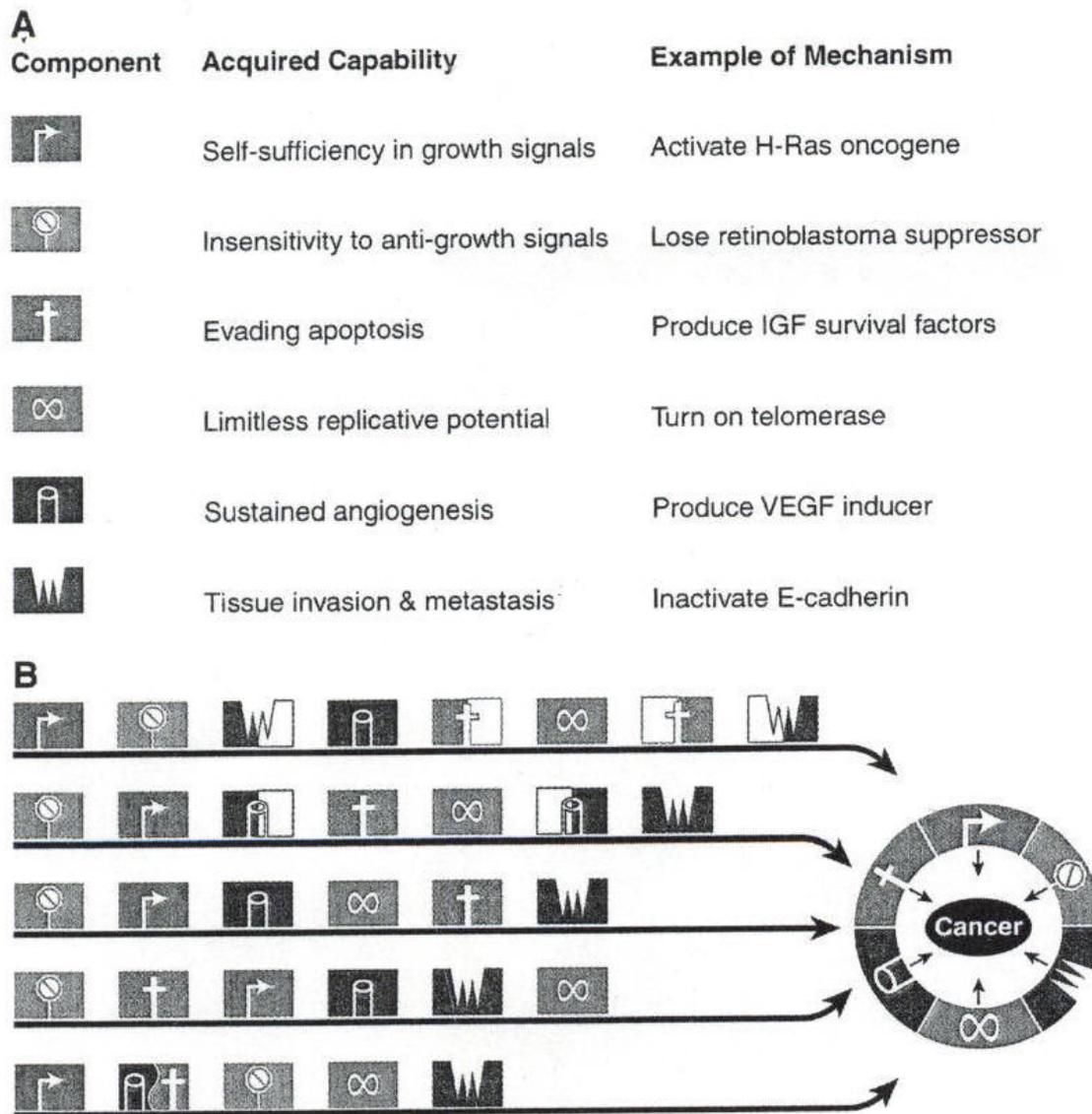


Figure 4. Parallel Pathways of Tumorigenesis

While we believe that virtually all cancers must acquire the same six hallmark capabilities (A), their means of doing so will vary significantly, both mechanistically (see text) and chronologically (B). Thus, the order in which these capabilities are acquired seems likely to be quite variable across the spectrum of cancer types and subtypes. Moreover, in some tumors, a particular genetic lesion may confer several capabilities simultaneously, decreasing the number of distinct mutational steps required to complete tumorigenesis. Thus, loss of function of the p53 tumor suppressor can facilitate both angiogenesis and resistance to apoptosis (e.g., in the five-step pathway shown), as well as enabling the characteristic of genomic instability. In other tumors, a capability may only be acquired through the collaboration of two or more distinct genetic changes, thereby increasing the total number necessary for completion of tumor progression. Thus, in the eight-step pathway shown, invasion/metastasis and resistance to apoptosis are each acquired in two steps.

Emerging Hallmarks

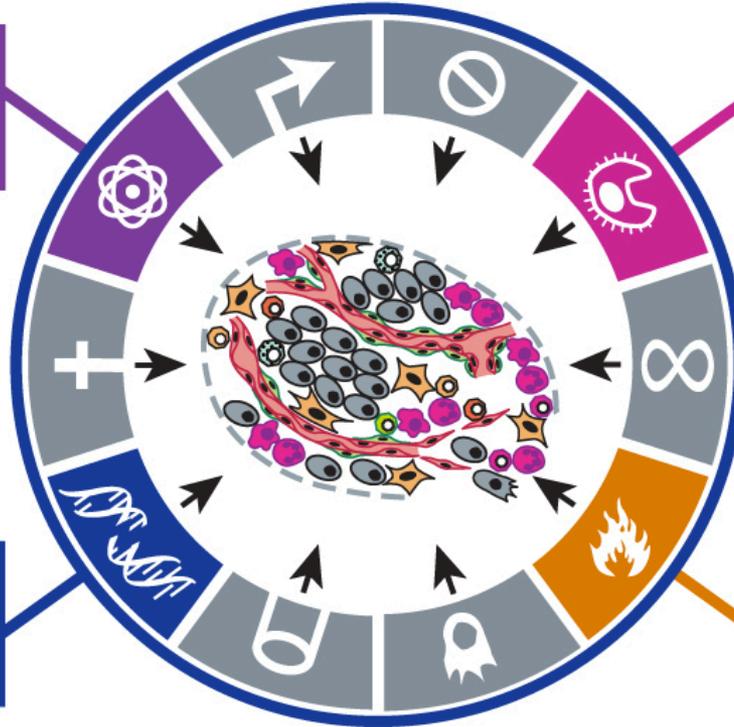
Deregulating cellular energetics

Avoiding immune destruction

Genome instability and mutation

Tumor-promoting Inflammation

Enabling Characteristics



# International Agency for Research on Cancer (IARC)

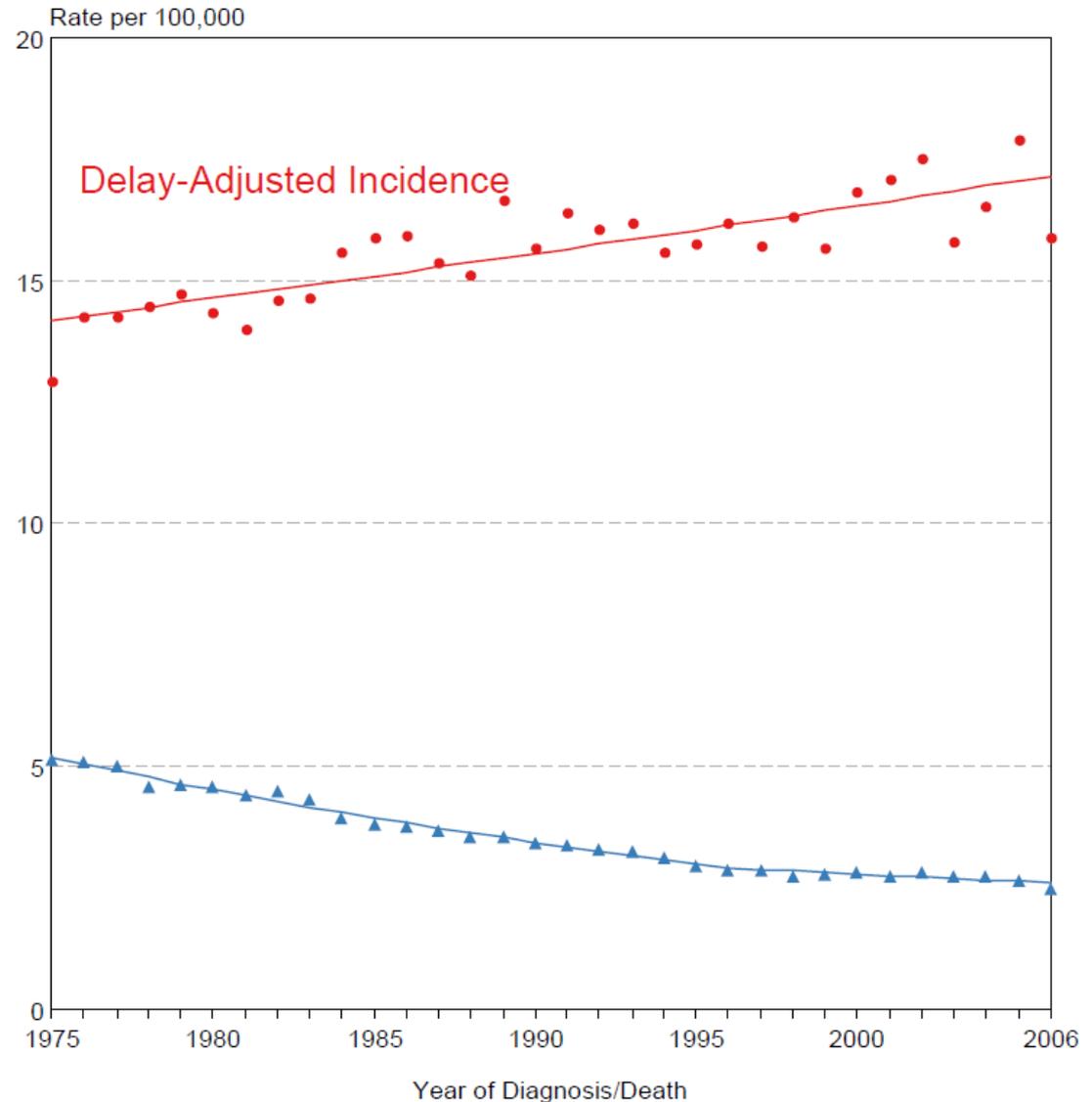
Evaluations of agents, mixtures, and exposures (as of Sept. 2012)

<b>Total agents evaluated</b>	<b>953</b>
• Carcinogenic to humans	108
• Probably carcinogenic to humans	64
• Possibly carcinogenic to humans	272
• Not classifiable	
508	
• Probably not carcinogenic to humans	1

Source: International Agency for Research on Cancer. <http://www-cie.iarc.fr/>.

# SEER Delay-Adjusted Incidence and US Mortality All Childhood Cancers, Under 20 Years of Age Both Sexes, All Races, 1975-2006

Childhood  
cancers:  
diet,  
exercise &  
smoking?



## Childhood Leukemias: Documented Links

- Ionizing radiation [Strong]
- Chlorinated solvents [Good]
- Metal dusts [Good]
- Specific Pesticides [Good]
- Secondhand smoke [Good]
- Trichloroethylene (TCE) [Good]
- Pesticides [Good]

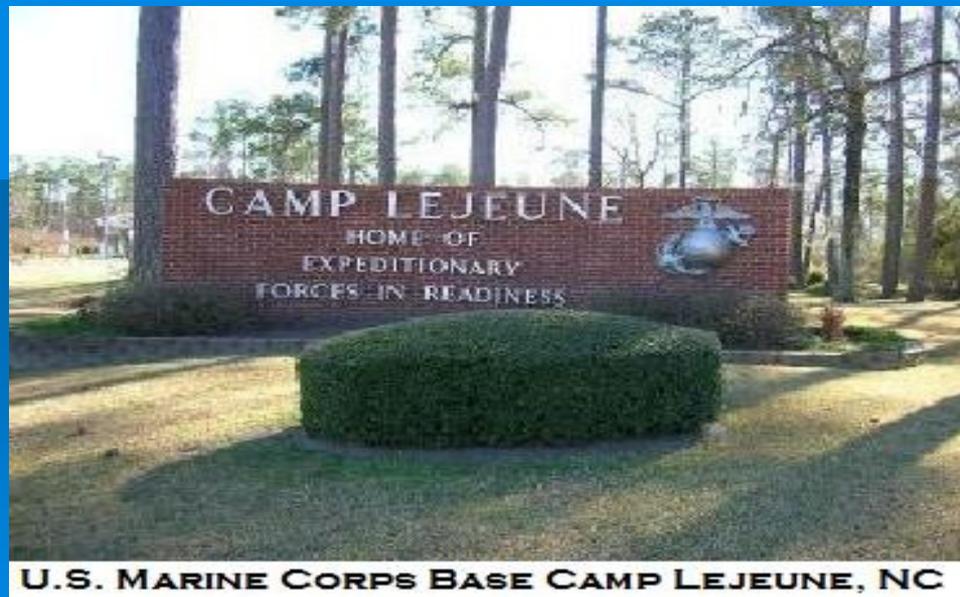
Source: Solomon G, Schettler T, Janssen S. "CHE Toxicant and Disease Database." Accessed 9-17-12: <http://database.healthandenvironment.org/>.

# Childhood Brain Cancer: Documented Links

- Ionizing radiation [Strong]
- Dichlorvos [Good]
- Lindane [Good]
- Second-hand smoke [Good]
- Solvents [Good]
- Pesticides [Good}

Source: Solomon G, Schettler T, Janssen S. "CHE Toxicant and Disease Database." Accessed 9-17-12: <http://database.healthandenvironment.org/>.

# Camp Lejeune, NC Drinking Water Contamination



# Camp Lejeune, NC water contamination studies

- TCE, Perc, benzene and other exposures in 1950s through 1985 at Marine training base; drinking water system modeled
- Hundreds of thousands of veterans and dependents exposed to contaminated drinking water (low ppb to 1,600 ppb of TCE)
- ATSDR studies began in 1997; Community Assistance Panel formed in 2006

## Camp Lejeune studies, cont.

- Marines and families (see website called “The Few, The Proud, The Forgotten”) driving the process
- Community Assistance Panel work with ATSDR has been extraordinary
- Congress passed legislation in 2012 to compensate veterans and family members

## Camp Lejeune studies, cont.

- Cohort follow-up study comparing Camp Lejeune to Camp Pendleton veterans near completion
- Health survey requested by CAP
  - Marines publicized ATSDR (contractor) survey in order to recruit participants
- Male breast cancer case-control study begun
  - Over 80 cases of male breast cancer identified
  - VA cancer registry involved in case identification

# A New Approach to Cancer Prevention in the US: the President's Cancer Panel

- With input from Molly Jacobs, Richard Clapp, David Kriebel, Jeanne Rizzo, Michael Lerner, Ted Schettler, Charlotte Brody



**Lowell Center** for Sustainable Production

UNIVERSITY OF MASSACHUSETTS LOWELL

# U.S. President's Cancer Panel

## What is it?

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- **Function statement:**
  - “To monitor the development and execution of the activities of the National Cancer Program, and report directly to the President.”
- **3 member panel appointed by the President**
  - Previous Chair: Dr. LeSalle Lefall, Professor of Surgery, Howard University College of Medicine
  - Previous Member: Dr. Margaret Kripke, University of Texas MD Anderson Cancer Center
- **Management and support services provided by NIH**



# Environmental Factors in Cancer

## Industrial and Manufacturing Exposures

### Chair

LaSalle D. Leffall, Jr., M.D., F.A.C.S.  
Charles R. Drew  
Professor of Surgery  
Howard University  
College of Medicine

### Member

Margaret L. Kripke, Ph.D.  
Special Assistant to the Provost  
The University of Texas  
M.D. Anderson Cancer Center

### Executive Secretary

Abby B. Sandler, Ph.D.  
National Cancer Institute

## PRESIDENT'S CANCER PANEL

Tuesday, September 16, 2008  
East Brunswick, New Jersey  
Hilton East Brunswick  
8:00am-4:15pm

The focus of this meeting will be:

- Effects of industrial pollutants
- The status of U.S. regulation of occupational and environmental exposures
- Research barriers in environmental health
- Occupational exposures
- Other industrial and manufacturing health concerns

For more information, please visit <http://pcp.cancer.gov>  
or contact Karen Parker at [klparker@mail.nih.gov](mailto:klparker@mail.nih.gov), or (301) 451-9462.

No registration required

This meeting is free and open to the public. Proceedings will be recorded.



## Industrial and Manufacturing Exposures

### Presenting Experts:

- Richard Clapp
- Devra Davis
- Adam Finkel
- Elizabeth Fontham
- David Kriebel
- Philip Landrigan
- Christopher Portier
- Paul Schulte
- Jeanne Stellman
- Daniel Wartenberg
- Frank Mirer
- Jeanne Rizzo

“The true burden of environmentally induced cancers has been grossly underestimated.”

Pres. Obama: “Use the power of your office to remove the carcinogens and other toxins from our food, water, and air that needlessly increase healthcare costs, cripple our nation’s productivity and devastate American lives.”

# REDUCING ENVIRONMENTAL CANCER RISK

What We Can Do Now



# Solutions going forward

“A precautionary prevention-oriented approach should replace current reactionary approaches to environmental contaminants in which human harm must be proven before action is taken to reduce or eliminate exposure”

2008–2009 Annual Report  President's Cancer Panel

## REDUCING ENVIRONMENTAL CANCER RISK

What We Can Do Now



# Solutions going forward

“ ‘Green chemistry’ initiatives and research, including process redesign, should be pursued and supported more aggressively...”

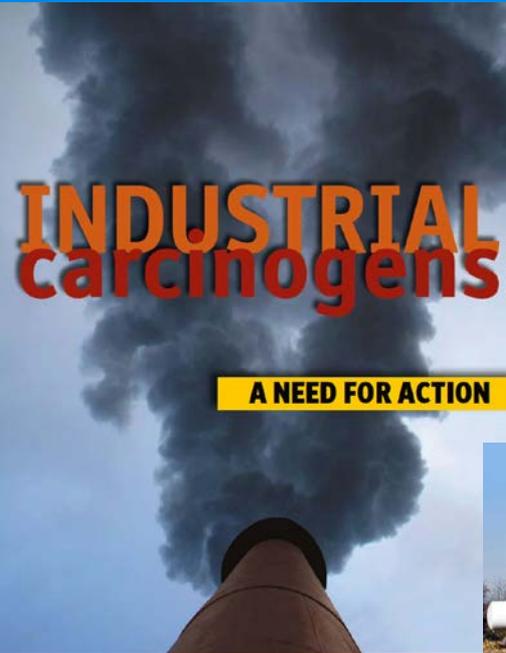
2008–2009 Annual Report  President's Cancer Panel

## REDUCING ENVIRONMENTAL CANCER RISK

What We Can Do Now



# Lowell Center Materials



Agriculture and Cancer



Radiation and Cancer





# Environmental and Occupational Causes of Cancer

A Review of Recent Scientific Literature

Richard W. Clapp, D.Sc.  
Genevieve K. Howe, MPH  
Molly M. Jacobs, MPH

*Prepared by*  
Boston University School of Public Health  
and Environmental Health Initiative,  
University of Massachusetts Lowell

*For the*  
Cancer Working Group of  
the Collaborative on Health and  
the Environment

**September 2005**



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Massachusetts  
Lowell

Richard W. Clapp, D.Sc.  
Genevieve K. Howe, MPH  
Molly M. Jacobs, MPH  
Ed Loechler, Ph.D.

September 2005  
And Update October 2007

[www.sustainableproduction.org](http://www.sustainableproduction.org)

# Other recent research

- Neurological disease and toxic exposures
  - Lou Gehrig's Disease among semiconductor workers
    - Potential link to solvent exposure
  - Parkinson's Disease and farm work
    - Potential link to pesticide exposure
  - Neurobehavioral effects in Gulf War veterans
    - Khamisiyah nerve gas exposure altered psychomotor and visuospatial abilities

# SEMPER FI

ALWAYS FAITHFUL

MCH Camp Lejeune et al.



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