

David Henry Cushing



1941 - 2009



Photographs of Dave always looked just like him. This is how I remember him. His characteristic smile, and his special little chuckle.

David's immediate family

Married to Helen for 48 years.

Four children, Susan, Patricia, David and Michael.

Brother, Alfred

Three grandchildren, Mitchell, Jacqueline and Alexandra

Early Career

One of my heroes is Edgar Barr. I never met Ed but I, like many others in optical coatings, knew of him. He published little but he made things and especially multiple-cavity narrow-band filters. There is a select group of people, getting old now, who began their careers with Edgar Barr.

Dave was one of that select group.

He began his career as a production technician at Baird Atomic Inc in 1959 but was running a department of 50 when he left in 1969.

During his ten years at Baird, Dave attended Northeastern University part time and gained his BSEE degree in 1969.

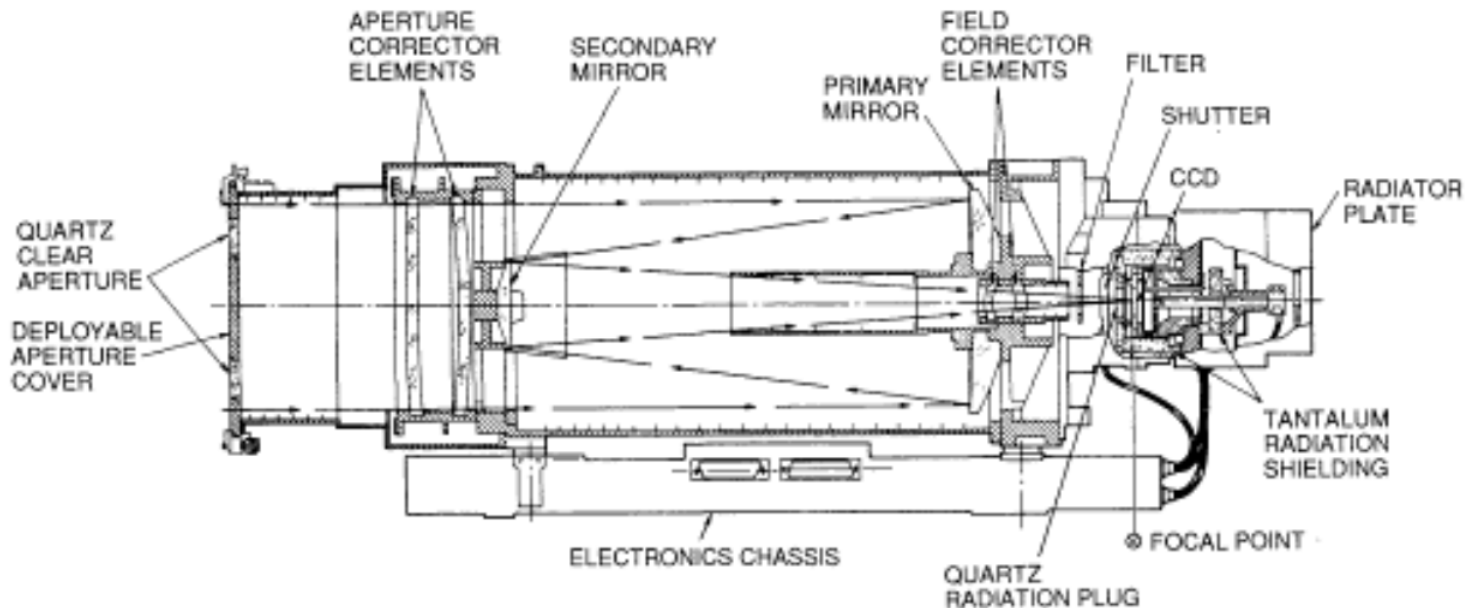
MicroCoatings Inc

Then came Microcoatings (1969 – 1990).

“The company was formed as a two-person partnership for the production of filters for medical electronics and defense. We purchased obsolete vacuum chambers and gutted them. These chambers were then rebuilt to manufacture (utilizing thermal evaporation) production quantity optical filters for many applications, such as laser range finders, semi-conductor lithography systems, printers, flame photometers, blood testers, and supermarket scanners.”

MicroCoatings Inc

MicroCoatings rapidly became known for high quality filters. They manufactured filters for the Galileo and Voyager spacecrafts. The Picture shows the Solid State Imaging camera for Voyager



The company was sold in 1986 and became Optical Corporation of America. Dave continued as Technical Director until 1990.

JDS Fitel Inc

Dave was with JDS Fitel from 1990 till 2001. He designed equipment for the production of telecom filters, particularly DWDM filters and was responsible for the first truly successful production shop for DWDM manufacture.

Dave's ideas and experience shaped the commercial machines that started to appear for DWDM manufacture.

During this time Dave started to publish his work, some in patents, some in conferences.

Corning Precision Lens

In 2001 Dave joined Corning Precision Lens to head thin film research and development. Typical products were filters, antireflection coatings and all kinds of general purpose coatings. He retired to Tucson in 2004.

In Tucson, Dave continued to publish.

College of Optical Sciences, University of Arizona

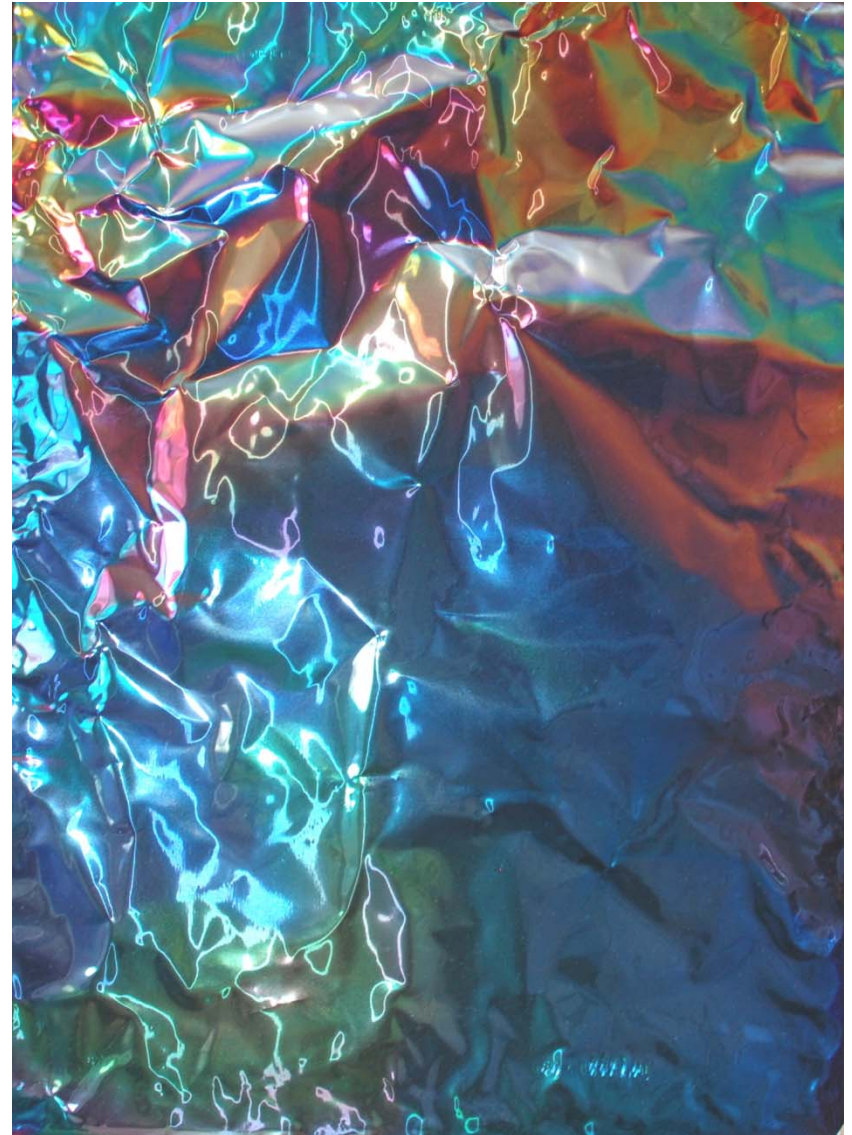
Dave joined the College of Optical Sciences as Visiting Scientist in 2004. and installed a coater there.

He became particularly interested in decorative coatings.

He used aluminum foil as substrate and the trick he developed was to coat the substrate first with Inconel and then to add a dielectric narrow band reflector to give the highly saturated colors.

An exhibition of his work was held in at Gallery 2402 in Tucson from December 2, 2009 to January 15, 2010

D. Cushing, "Rainbow filters," *SVC News Bulletin (Spring)*, 32-33 2009

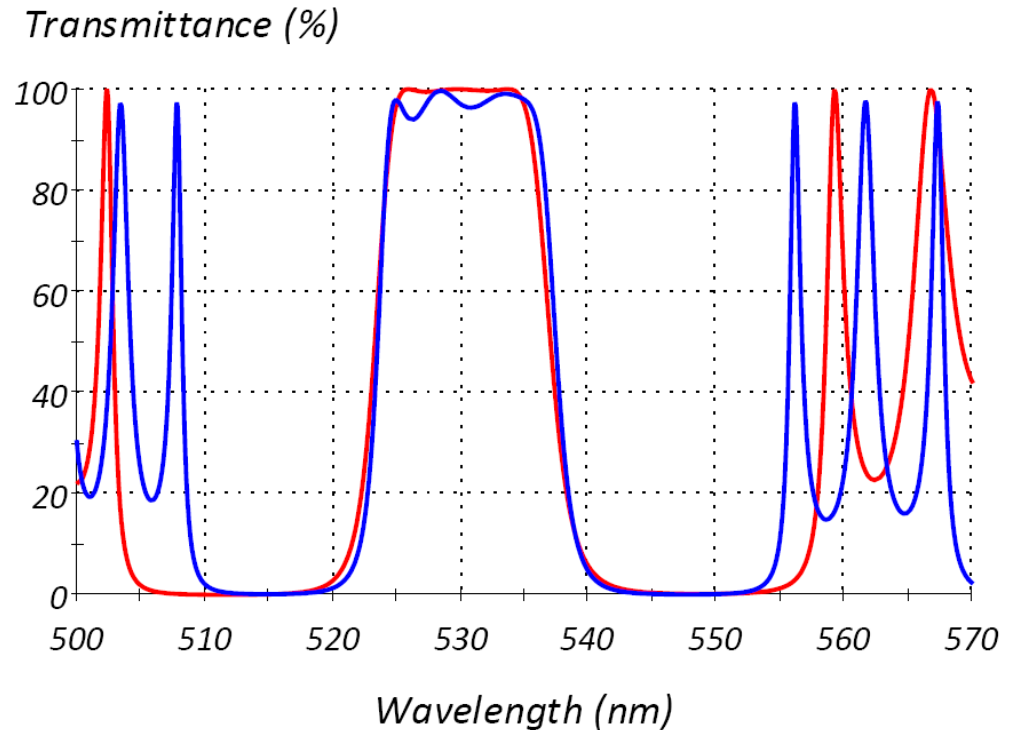


Some Publications

1. J.C. Simons and D.H. Cushing, "Optical filters for high resolution ultraviolet imaging systems," *Proceedings SPIE*, 932, 148-152 1988
2. J.C. Simons and D.H. Cushing, "Ultraviolet narrowband filters with both high transmittance and superior rejection for imaging situations," *Proceedings SPIE*, 1158, 346-350 1989
3. D.H. Cushing and J.C. Simons, "Neutral density filters for the ultraviolet that obey Beer's law," *Proceedings SPIE*, 1158, 189-193 1989
4. D.H. Cushing, USA Patent 4,960,310, "Broad band nonreflective neutral density filter," 1990
5. A. Zöllner, R. Götzelmann, K. Matl, and D. Cushing, "Temperature-stable bandpass filters deposited with plasma ion-assisted deposition," *Appl. Opt.* 35(28), 5609-5612 1996
6. G.S. Duck, D.H. Cushing, and S.J. Mihailov, USA Patent 5,615,289, "Bandpass Optical Filter," 1997
7. D.H. Cushing, USA Patent 5,719,989, "Multilayer thin film bandpass filter," 1998
8. D.H. Cushing, USA Patent 5,999,322, "Multilayer thin film bandpass filter," 1999
9. D. Cushing. "Bandpass filter for forty five degree angle with low polarization properties." *Optical Interference Coatings, WB3, 1998*
10. D.H. Cushing, USA Patent 5,926,317, "Multilayer thin film dielectric bandpass filter," 1999
11. D.H. Cushing, USA Patent 6,018,421, "Multilayer thin film bandpass filter," 2000
12. D.H. Cushing, USA Patent 6,011,652, "Multilayer thin film dielectric bandpass filter," 2000
13. D. Cushing. "Thin film interference filter for 45° angle of incidence inside a glass prism with extremely low polarization dependence." *43rd Annual Technical Conference Proceedings, SVC*, pp. 252-257, 2000
14. D.H. Cushing, "Band shape improvement techniques," *Proceedings SPIE*, 4094, 65-73 2000
15. D. Cushing. "Narrow Band UV MDM Filter for the New Millenium." *Optical Interference Coatings*, pp. TuA8, 2001
16. D. Cushing. "Band pass filters for 40GB/s." *46th Annual Technical Conference Proceedings, SVC*, pp. 323-327, 2003
17. D. Cushing. "Manufacturable filter for CWDM's." *47th Annual Technical Conference, SVC*, pp. 383-388, 2004
18. D. Cushing. "Filter sets for the visible spectrum." *49th Annual Technical Conference, SVC*, pp. 712-715, 2006
19. D. Cushing. "A new approach to blocked multi-cavity filters." *49th Annual Technical Conference, SVC*, pp. 239-244, 2006
20. D. Cushing, "Silver filter development for blocking all dielectric interference filters," *SVC News Bulletin (Winter)*, 32-34 2006
21. D. Cushing. "Bandpass filter with improved blocking." *50th Annual Technical Conference, SVC*, pp. 480-484, 2007
22. D.H. Cushing. "Long Term Stability of Low Index Mixed Fluorides." *Optical Interference Coatings*, pp. TuB8, 2007
23. D.H. Cushing. "Completely Blocked Ultra Violet Filters." *Optical Interference Coatings*, pp. TuD6, 2007
24. D. Cushing. "Broadband metal dielectric filters." *52nd Annual Technical Conference, SVC*, pp. 422-426, 2009
25. D. Cushing, "Rainbow filters," *SVC News Bulletin (Spring)*, 32-33 2009

Some Designs

This is one of Dave's designs for a nonpolarizing narrowband filter at 45° incidence in glass presented at the 2000 SVC Annual Technical Conference



— p-pol — s-pol

$G | ((HMLM)^2 || (MLMH)^2 L) ((HMLM)^4 || (MLMH)^4 L)^3 ((HMLM)^2 || (MLMH)^2 L) | G$

$n_G = 1.52 \quad n_H = 2.25 \quad n_L = 1.38 \quad n_M = 1.69 \quad n_I = 1.855$

Dave's Book

Advanced Optical Filters

This book is dedicated to my wife Helen,
who has helped me make the most of my life.

Chapter 1 Basics

Chapter 2 Deposition Methods and Materials

Chapter 3 AR Coatings

Chapter 4 Multilayer Films

Chapter 5 Dichroics

Chapter 6 Metal Films and Filters

Chapter 7 All Dielectric Bandpass Filters

Chapter 8 Optical Monitoring

Chapter 9 Fully Blocked Visible Filters

Chapter 10 Fully Blocked Ultraviolet Filters

Chapter 11 Non-Polarizing Filters – Reflective only

Chapter 12 Non-Polarizing Filters – Transmissive

To be published by SPIE, the International Society for Optics



David H. Cushing Scholarship

A native of Boston, David H. Cushing began his career in thin films in 1959 as a production technician processing filters made by his mentor Edgar Barr at Baird Atomic Inc. For the next fifty years Dave pursued his passion for thin films with great success until his death in 2009. At the height of his career he and a partner established MicroCoatings, Inc. which helped design and manufacture filters for the Galileo and Voyager satellites.

Dave earned his BSEE degree in 1969 from Northeastern University while working full time and also starting his family.

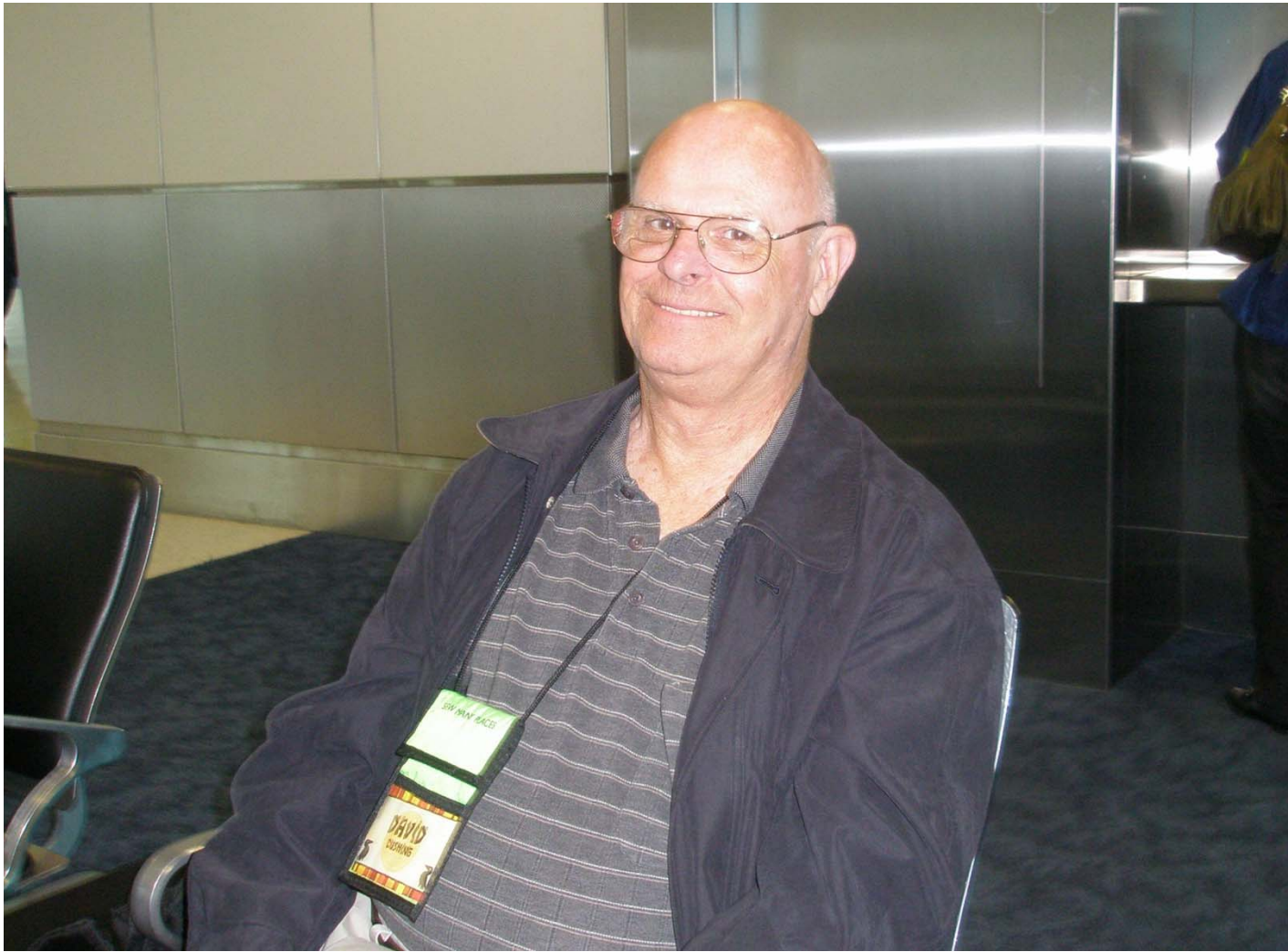
This scholarship was established by Helen Cushing as a legacy to Dave's passion for thin films and in memory of a loving husband, father and dear friend.



College of Optical Sciences
THE UNIVERSITY OF ARIZONA

The David H. Cushing Endowed Scholarship for Undergraduate Students in Optical Sciences. Established by Helen Cushing as a legacy to Dave's passion for thin films and in memory of a loving husband, father and dear friend.

Contact: Will Rivera
Optical Sciences,
wrivera@optics.arizona.edu



We shall miss you, Dave