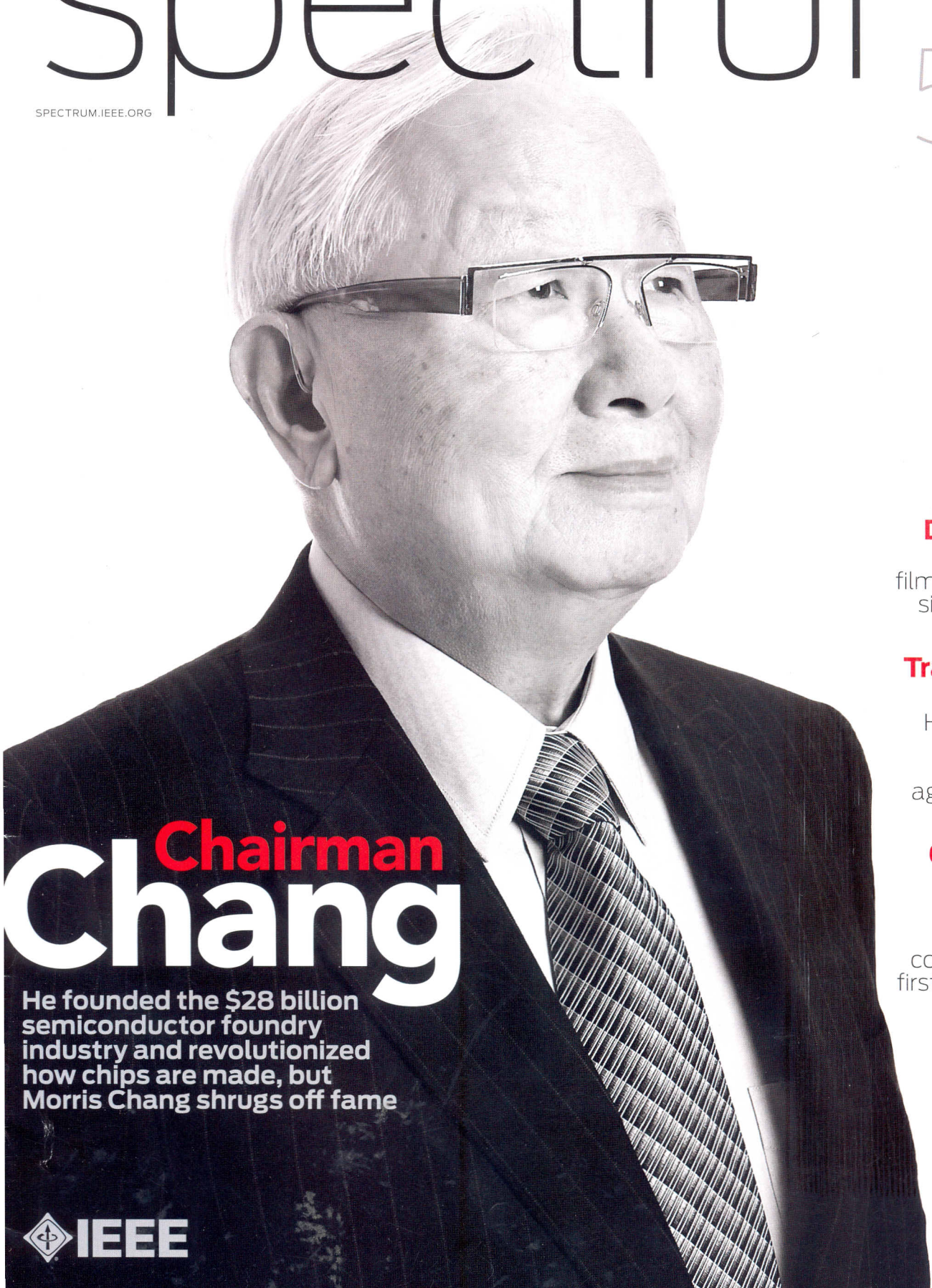


IEEE  
SPECTRUM

THE MAGAZINE OF TECHNOLOGY INSIDERS

SPECTRUM.IEEE.ORG

5.11



**Chairman**  
**Chang**

He founded the \$28 billion semiconductor foundry industry and revolutionized how chips are made, but Morris Chang shrugs off fame

**Faster, Sharper Displays**

New thin films do what silicon can't

**Transistor Decay**

How much life is left in your aging chips?

**Circuits of the Past**

Relics of computing's first centuries



COVER:  
GARRET M.  
CLARKE

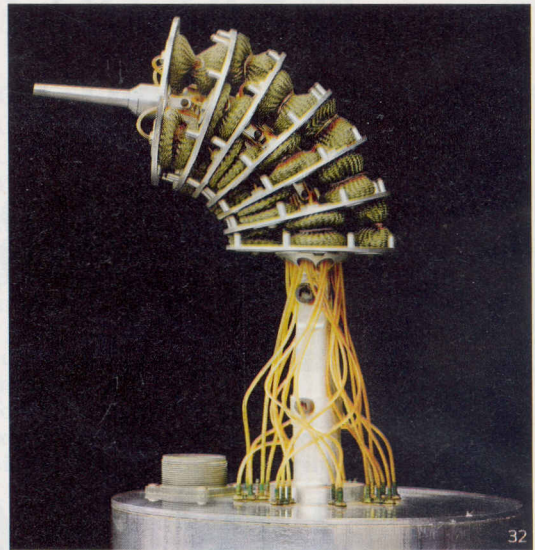
THIS PAGE, CLOCKWISE  
FROM LEFT: GARRET M.  
CLARKE; MARK RICHARDS;  
ERIC SUNDHOLM

46

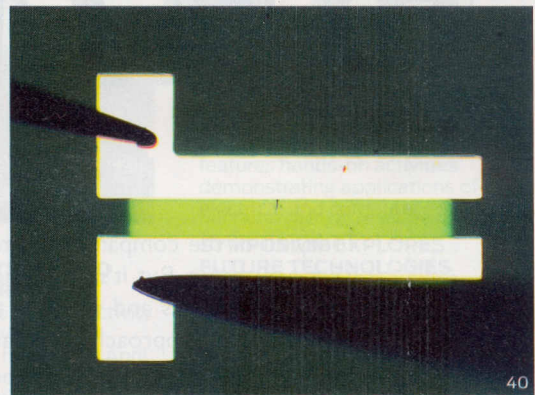
COVER STORY

## 46 FOUNDRY FATHER

When Morris Chang started Taiwan Semiconductor Manufacturing Co., he spawned the semiconductor foundry industry. His leadership in the field earned him the 2011 IEEE Medal of Honor.  
*By Tekla S. Perry*



32



40

## 26 AN ODOMETER FOR CPUs

Microprocessors don't normally show wear and tear, but wear they do. If we had better ways to gauge their declining capabilities, we could squeeze more performance out of them.

*By John Keane & Chris H. Kim*

## 32 BITS OF HISTORY

A robotic arm, a Nazi encryption machine, and a roll of data tape that helped launch Microsoft are among the 1200 computing artifacts featured in a new exhibit at the Computer History Museum.

*By Joseph Calamia / Photography by Mark Richards*

## 40 THIN, FAST, AND FLEXIBLE

Tomorrow's big-screen displays will need to switch their pixels far faster than silicon thin-film transistors can. Conveniently, a promising family of metal-oxide semiconductors is coming into its own right now. *By John F. Wager & Randy Hoffman*