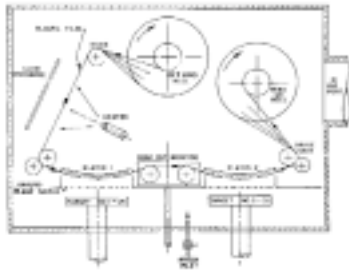


1972 – 1975

Johan K. Fremerey
Spinning rotor
vacuum gauge
1972

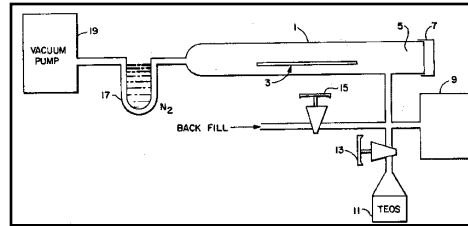


R. C. Merrill G.J. Egan, B.W.
Paszek and A.J. Aronson
Roll coater for deposition on
plastic film
1972

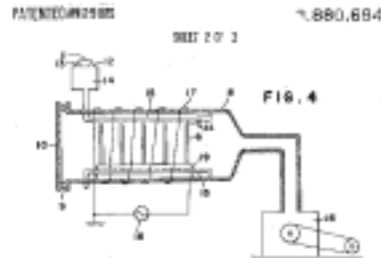


Last Apollo Mission
The Earth in the vacuum
of space – from Apollo-17
(NASA - 1972)

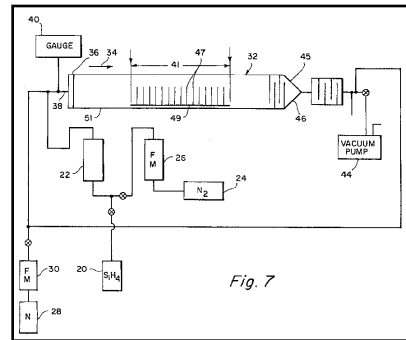
Special Report: Vacuum
Physics Today
August 1972



Low-Pressure Chemical Vapor Deposition of
Silicon Dioxide from Tetraethoxysilane
Dan L. Burt, Richard F. Taraci and John E. Zavion
U.S. Patent 3934060 (1976), filed 1973



Horuhiko Abe, Japan
Plasma etching of semiconductors
U.S. Patent 3880684 (1975)
filed 1973

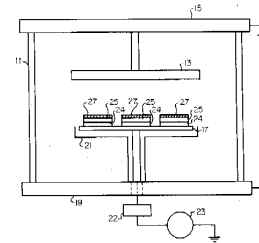


Low-Pressure Chemical Deposition
of Polysilicon
Jerry L. Kruma and Paul G. Hilton
U.S. Patent 3900597 (1975)
filed 1973

First oil-free piston
vacuum pump
John L. Farrant
1974



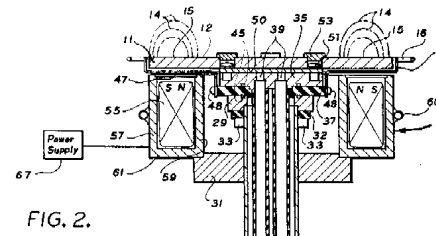
Altair 8800 Computer
1975



Reactive ion etching
Steven Yoneo Muto
U.S. Patent 3971684 (1976)
filed 1973

Structure Zone Model for
sputter-deposited films
John A. Thornton
1974

Ferrofluidic™ rotary shaft seal
Ferrofluidics Corp.
1974



John S. Chapin
Planar magnetron sputter
deposition source
U.S. Patent 4166018 (1979)
filed 1974

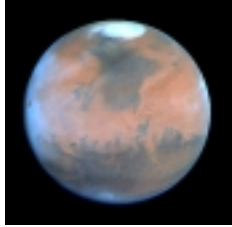
Kalrez®
perfluorocarbon
elastomers
E. I. du Pont de
Nemours & Co.
c. 1975

Cryo-pumps for
Space Simulation and
semiconductor fabrication
1975

Zenith shuts down
Lansdale, PA unit
1975

1972

1976 – 1989

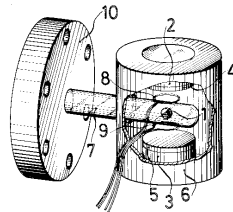


Viking I and II
land on Mars
1976

First commercial
convection Pirani gauge
1977

Kai Manne Börje Siegbahn
(1919–1981)
Nobel Prize in Physics
for high resolution
electron spectroscopy
1981

Intel 8086
16-bit microprocessor.
29,000 transistors
4.77 MHz
(100 mm wafers)
June 1978

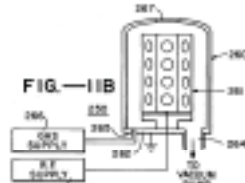


**Gas Friction Vacuum
Meter (spinning rotor gauge)**
Johan K. Fremery and Bernd
Lindenau, Germany
U.S. Patent 3395914 (1983)
filed 1981

Compound Molecular Pump
Osaka Vacuum Ltd.
1980

Large non-evaporable
getter panel
1976

Motorola 68000
microprocessor chip
(used in 1984 Apple
Macintosh)
1979



**Hexode Reactive Ion Etch
Tool**
David N. Wang, Frank D.
Egitto, and Dan Maydan –
Applied Materials (U.S.A.)
U.S. Patent 4376672 (1983)
filed 1981

RCA closes Harrison, NJ
receiving tube plant
Sylvania takes over
Nuvistor line
April 30, 1976

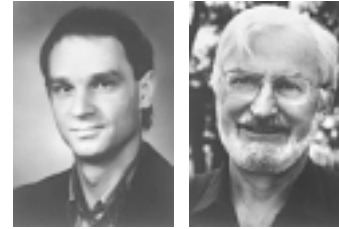


AVS logo
adopted
1979

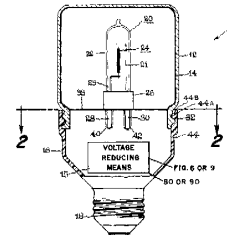
Tokamak Fusion Test Reactor
begins operation (U.S.)
1982

WE 215A vacuum tube
manufacture shutdown
1981

The *Journal of
Vacuum Science &
Technology* splits
into A & B issues
1983



Gerd Binnig and Heinrich Rohrer
Nobel Prize in Physics for
scanning tunneling microscopy
1986



**Improved halogen
incandescent lamp**
Walter K. Brinn, et al.
U.S. Patent 4547704 (1985)
1983

Sputter coating
for computer
hard disks
c. 1983

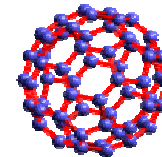
Gerd Binnig, Calvin F. Quate
and Christof Gerber
Atomic Force Microscope
1986

Ernst August Friedrich Ruska
(1906-1988)
Nobel Prize for transmission
electron microscope
1986

Wolfgang Paul
Nobel Prize in Physics
for Paul Trap for
charged particles
1989

Hans Georg Dehmelt
Nobel Prize in Physics
for use of Penning Trap
to study charged particles
1989

Computer Compact Disc
with vacuum-deposited
thin films
1984



Richard E. Smalley
(1943-2005),
Harry Kroto, et al.
C₆₀ molecule
discovered
1985

150 mm wafers
fabricated December 1983
1.2 million-transistor
Intel 80486™ 25 MHz processor
April 1989

Edwards Co. (England)
Dry vacuum pump
1985

The last major U.S. vacuum tube
production line shut down
(Raytheon)
1986

1976

1989

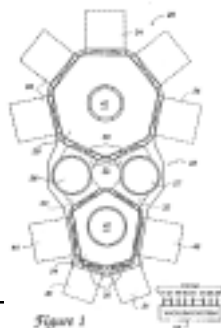


1990 – 1999

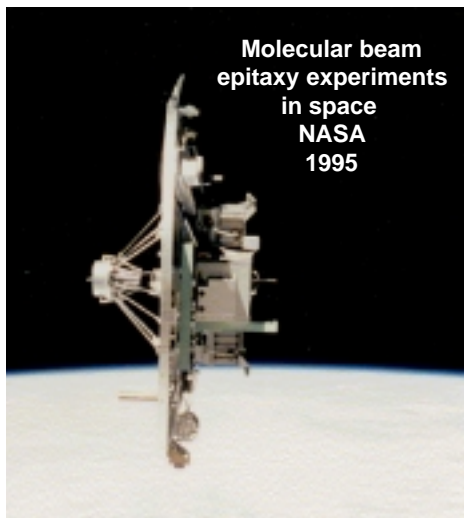
Hubble Space Telescope
placed in orbit
NASA
1990



Ultra high vacuum production
sputter deposition system
Avi Tepman, Howard Grunes,
Sasson Somekh, Dan Maydan –
Applied Materials (U.S.A.)
U.S. Patent 5186718 (1993)
1991

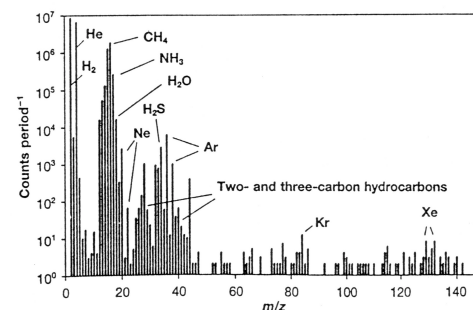


Molecular beam
epitaxy experiments
in space
NASA
1995

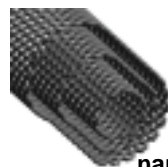


Hubble Space Telescope
fully functional after repair
NASA
1993

Eric Allin Cornell, Wolfgang Ketterle,
and Carl Edwin Wieman
Synthesize Bose-Einstein condensate
1995



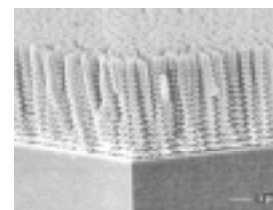
Mass spectrum of Jupiter's atmosphere
1996



Sumio Ijima
1-nm carbon
nanotubes reported
1991

First 200 mm
semiconductor
wafers produced
April 1992

Light emitting
polymer devices
demonstrated
1996



First mass production
vacuum processing
system for organic light
emitting diode displays
1999

C₆₀ named
'Molecule of the Year'
SCIENCE Magazine
1991

First commercial plasma
color television display (21-inch)
1992

Digital Versatile Disc (DVD)
with vacuum-deposited
thin films
1996

Thin film structure control by
glancing angle deposition (GLAD)
Kevin J. Robbie and
Michael J. Brett (Canada)
1997



New AVS logo
adopted
1990



The *Bell Jar* subscription quarterly
for the amateur scientist,
becomes an internet site
Stephen P. Hansen
January 1992

First Issue of
Surface Science
Spectra
1992

Intel introduces
Pentium™ processor
(200-mm wafers)
March 1993

Glass vacuum tube
manufacturers remaining in 1997:
USA (7), Eastern Europe (7),
China (2), Russia (2), and France (1)

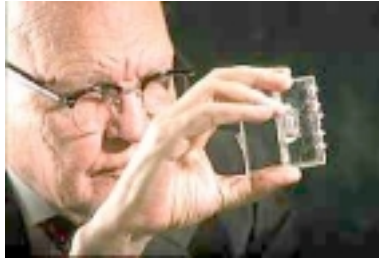
1990

Vacuum Science & Technology Timeline

1999



2000 – 2007



Jack St. Clair Kilby
(1923-2005)
Nobel Prize in Physics
Integrated Circuit
2000



Zhores I. Alferof (1930-)
and **Herbert Kroemer (1928-)**
Nobel Prize in Physics
Heterojunction transistor,
solid state laser
2000

Alan Graham MacDiarmid
(1927-2007) , **Hideki**
Shirakawa, and **Alan J.**
Heeger
Nobel Prize in Chemistry for
the discovery of
conducting polymers
2000

Eric Allin Cornell,
Wolfgang Ketterle,
and **Carl Edwin Wieman**
Nobel Prize in Physics
for production of
Bose-Einstein condensate
2001

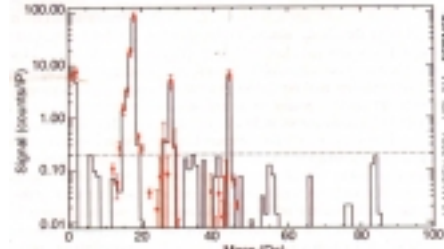
John L. Hall and
Theodor W. Hänsch
Nobel Prize in Physics for
contributions to the
development of laser-based
precision spectroscopy
2005



The world's smallest high-
performance quadrupole mass
spectrometer (16-rods) installed in
the International Space Station
2001



Flat panel TV displays made on
60 x 70-inch glass sheets
2004



Mass spectrum of water
plume on Saturn satellite
NASA
2006

Integrated circuits on
300-mm silicon wafers in
mainstream production
2005

Plasma chemical vapor
deposition and vacuum
evaporation used in mass
production of organic
light-emitting diode
displays
2006



50th Anniversary of AVS
2003



Kodak digital camera with
2.3-inch organic light
emitting diode display
2003

Cathode ray tube
displays become
obsolete
2005

Nvidia graphics chip set,
128 processors, 681
million transistors
2006

50-inch diagonal plasma
television displays
2006



Russian-made vacuum
tubes used in audio
amplifiers (England)
2007

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Electron Tube Research: Perham Foundation
Intel images courtesy of Intel Corporation
Revision date: August 2007 www.avs.org

