

**Major Achievements of the  
Texas Instruments  
Central Research  
Laboratory**

**1955-1975**

1. Low-temperature germanium bolometer (Frank Low, 1961). Using this instrument, Frank pioneered the field of infra-red astronomy
2. CRYOFLASK (Frank Low)
3. E-beam fabrication of microwave transistor (Pankratz)
4. Pioneering work on Surface Acoustic Wave (SAW) devices (Clinton Hartmann and L. Claiborne)
5. Ferromagnetic Resonance Angular Transducer Sensor (FRAT) (C. Penn, F. West, and T. Hasty)
6. 3-D seismic processing (Choate)
7. HgCdTe infrared detector (George Pruett, Borello, Breazeale, and Roberts)
8. PbSnTe work on IR sensors (Dick Chapman, Milo Johnson, and Henry Morris)
9. Basic research on semimetals and narrow gap semiconductors. It involved the study of carrier transport and band structures using piezoresistance (Drobish, Bate, and Einspruch), galvanomagnetic measurements (Antcliffe, Hardin, Bate, and Einspruch), and magnetoplasma wave propagation (Wisseman and Bate). The paraelectric and ferroelectric properties of narrow gap IV-VI compounds were also studied (Antcliffe, Bate, Carter, Buss, and Kinch)
10. Development of the first metal-insulator-semiconductor (MIS) HgCdTe devices (1970) (Al Tasch, Bill Breazeal, and Dick Chapman). Later, Dennis Buss, Dick Chapman, and Mike Kinch expanded this work, resulting in their receipt of the IEEE Jack Morton Award in 1987 for research on solid-state devices
11. Optoelectronic properties and optimization of materials for infrared sensors:

HgCdTe, PtSi<sub>2</sub>, Ge:Hg, etc. (Reynolds, Brau, Chapman, and Beyen)

12. Tunable lead-salt diode lasers for auto exhaust monitoring (Antciffe, Bate, and Wrobel)
13. Chalcogenide glasses for infrared windows (R. Hilton)
14. First one-million-pixel charge-coupled device (CCD) imager (Collins)
15. He magnetometer (Colegrove, Schearer, and Rice)
16. Study of electron spin resonance (EPR) in II-VI compounds (Watts & Holton)
17. Anomalous ultrasonic absorption in hard superconductors (Claiborne and Einspruch)
18. First superconducting Helmholtz pair (Younse and Einspruch)
19. Start up of the TI Japan front-end.(Cliff Penn, Tom Hartman, and others)
20. LCD watch display (Andy Penz, Charles Ristagno.)
21. GaAs bulk and epitaxial crystal growth (George Cronin and Don Shaw): led to the early development of Gunn and IMPATT diodes (Hasty, McQuiddy, and Wisseman), and in the late 1960's to the beginning of microwave technology critically dependent on GaAs
22. Instrument for measuring epitaxial silicon film thickness (EPILOG) (Larrabee).
23. As part of an overcoating and passivation project to increase the yield of silicon devices, silicon nitride (Si<sub>3</sub>N<sub>4</sub>) was studied by Tom Hartman and Ike Trachtenberg, but the deposition process required 800 degrees C. Alan Reinberg then developed a ground-breaking plasma process that ran below 400 degrees. His plasma reactor was subsequently widely used in production at TI.
24. LED-pumped solid state laser (Holton)
25. A study of upper-laser-level lifetimes and Penning production cross sections for He-Cd and He-Zn lasers explained their mode of operation (Schearer and Holton)
26. Flat Panel TV display (Scott and Holton)
27. Seminal studies of stress-induced mobility changes in p-channel MOSFETs. (Colman, Bate, and Mize)

28. Important professional contributions of Technical Staff, including several hundred outstanding peer-reviewed science and engineering publications in national and international journals, US and foreign patents, participation in international scientific and engineering conferences, and service on government advisory committees. These activities were crucial to the establishment of the worldwide reputation of TI as a highly regarded contributor to science as well as engineering
29. During the 1955-1975 period, Ross Macdonald and Frank Low were elected to the National Academy of Sciences and Ross to the National Academy of Engineering, while Bob Brodersen, Bob Fontana, Larry Hornbeck, Don Shaw, Al Tasch, and Bob Stratton were later elected to the NAE as well.