If you think SDS just builds computers, write our last name a hundred times.

Scientific Data Systems A Xerox Company El Segundo, Calif.
(Above) One hundred-million-volt accelerator for electrons provides world’s most intense beam (65 kilowatts average power) in this high-energy region. It can provide 10 to 150 Mev electrons to three experimental rooms and eventually to an above-ground, time-of-flight neutron facility. High quality beam control provides unique capability for precision experiments.

(Right) Deadweight stack of the new 1-million-pound-force deadweight machine recently installed in the Engineering Mechanics Building. The improved calibration accuracy obtainable with this machine is of vital importance to the nation’s space program. The weights, each 50,000 pounds, are 10 feet in diameter. Most of the stack is below first-floor level in a 26-foot pit. James L. Price, staff member, adjusts the temperature control.

[Photos of the apple tree, reactor, diamond- and free radicals are by Gary Laurish. All other photos are by the author.]
(Above) Ten-megawatt heavy water research reactor features split-fuel elements that permit beams to be taken from the central region of the reactor without directly viewing the fuel—thus avoiding high energy fission neutrons. A unique feature is a 20°K cold neutron facility with two separate beam ports. Maximum thermal neutron flux is $1.7 \times 10^{10}$ (neutrons/cm$^2$ sec) and maximum fast neutron flux is $1.2 \times 10^{11}$ (neutrons/cm$^2$ sec).

(Below) Twenty-foot cesium beam resonator which serves as present NBS Frequency Standard and provide basis for an atomic time scale, NBS-A, started in 1957. Accuracy of frequency standard ± 5 parts in $10^{10}$ (3σ). Improvements being incorporated this year are expected to improve accuracy tenfold.
(Left) NBS basic research into polymers produced this brightfield electron micrograph of portions of lozenge-shaped lamellar crystals of polyethylene which are typically about 10 nanometers thick. The long chain, polyethylene molecules in these crystals are regularly folded in the manner depicted in the model (below) in which only two successive folds along a polymer chain are shown. The molecular stems between successive folds are oriented either at right angles, or nearly so, to the plane of these thin lozenges.

(Right) Ortho-para conversion in liquid hydrogen. Schematic representation shows ortho (top) deformed by electromagnetic field of fast catalyst discovered at NBS. It breaks its bond (lower left) and reunites (lower right) to form para. Without conversion, liquid would emerge as 75 percent ortho. Slow spontaneous conversion to para during storage would evaporate about 50 percent of liquid. Catalytic conversion during liquefaction eliminates this boil-off loss.

(Above) A newly developed beryllium diamond-anvil pressure cell permits x-ray diffraction data on crystals under pressures as great as 40,000 kilobars. Small enough to be held in the hand, a cell is shown mounted in an x-ray diffraction instrument (arrow). Visual and spectroscopic examinations are also possible.

(Right) A typical x-ray pattern obtained by using the NBS beryllium diamond-anvil pressure cell—in this case showing the patterns found in a single crystal of bromine at room temperature and approximately 10 kilobars. Spots and streaks are a result of x-rays diffracted by the crystal.

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Applications of rapidly developing laser techniques include a redetermination of the velocity of light and lunar reflections. Shown above is a 30-meter vacuum interferometer installed in disused mine near Boulder, Colorado. When driven by a stabilized laser it shows earth tides and promises a new value for $c$ (speed of light) with two or three orders of magnitude improvement in accuracy. Shown below is the lunar reflector developed by an interlaboratory team on which NBS was strongly represented; it was placed on the moon during the Apollo 11 visit.

The 1962 discovery by Josephson, in Cambridge, England, of the peculiar properties of junctions between superconductors gives promise of new and improved standards for electric voltage and of very low temperature ($0.1^\circ$K). The top figure shows several junctions used for a possible voltage standard compared with a standard cell. Measurement of emitted frequencies from the junction indicates the voltage. The bottom figure shows a junction mounted on a helium dilution refrigerator. Measurement of its junction thermal voltage fluctuations indicates the absolute temperature.
(Top, left) New State Mass Standards, 50 pounds to $10^{-4}$ pounds. Each state also receives metric and English standards for mass, length, and volume.

(Top, center) Standard reference sample of cholesterol, 99.4 ± 0.3 percent pure, one of hundreds of Standard Reference Materials issued by NBS for calibrating measurement systems or producing consistent data referred to a common base.

(Top, right) Chemistry of simple gaseous free radicals is studied through instrumentation utilizing flow-system techniques to produce steady-state conditions. Radicals are produced by passing a stable gas through an electric discharge, are pumped rapidly through a tube, and detected by their electron paramagnetic resonance spectrum.

(Center, right) Blazing pajamas of this mannequin, representing a young child, figure in laboratory tests on flame spread conducted by the NBS Office of Flammable Fabrics. This research illustrates NBS responsibility for mandatory standards under legislation addressed to particularly urgent situations affecting health and safety.

(Center, left) Liquid nitrogen-cooled krypton-86 light source (left) and optical interferometer (center) which counts wavelengths equivalent to a length of graduated scale (right). International agreement of 1960 specifies the meter as 1,650,763.73 wavelengths in vacuum of the krypton orange-red radiation, thus defining an independently reproducible meter in terms of an invariant atomic property.

(Lower left) Ultrasonic thermometer provides accurate thermodynamic temperature determinations in the $2^\circ$ to $20^\circ$K range.