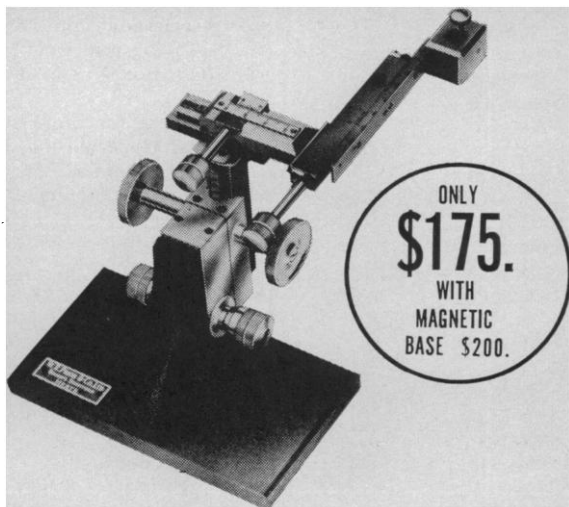


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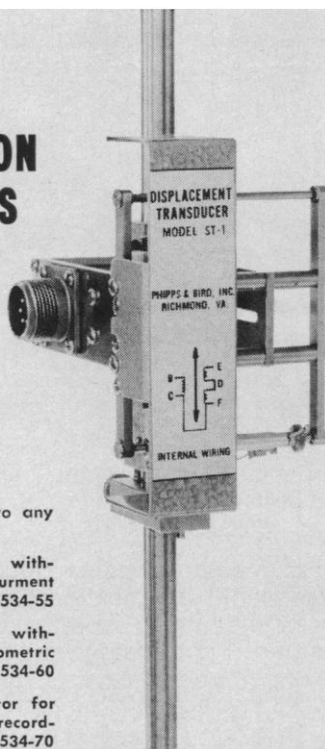
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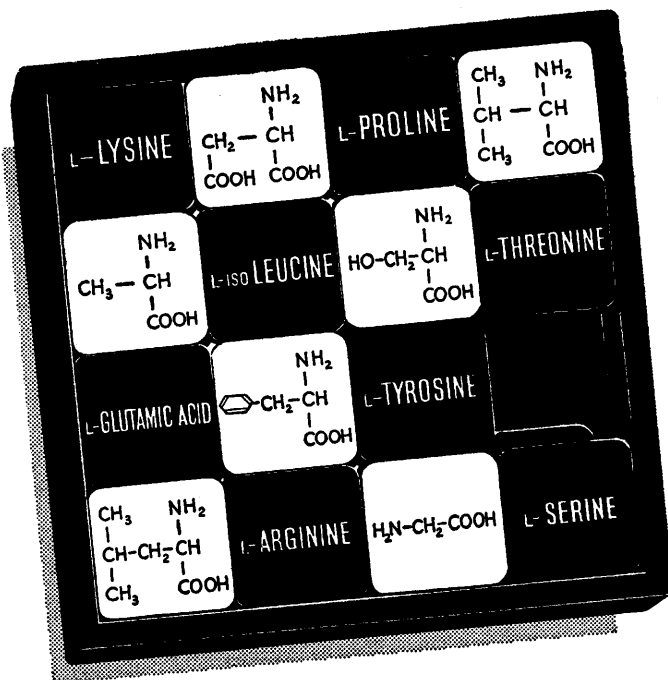
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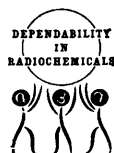
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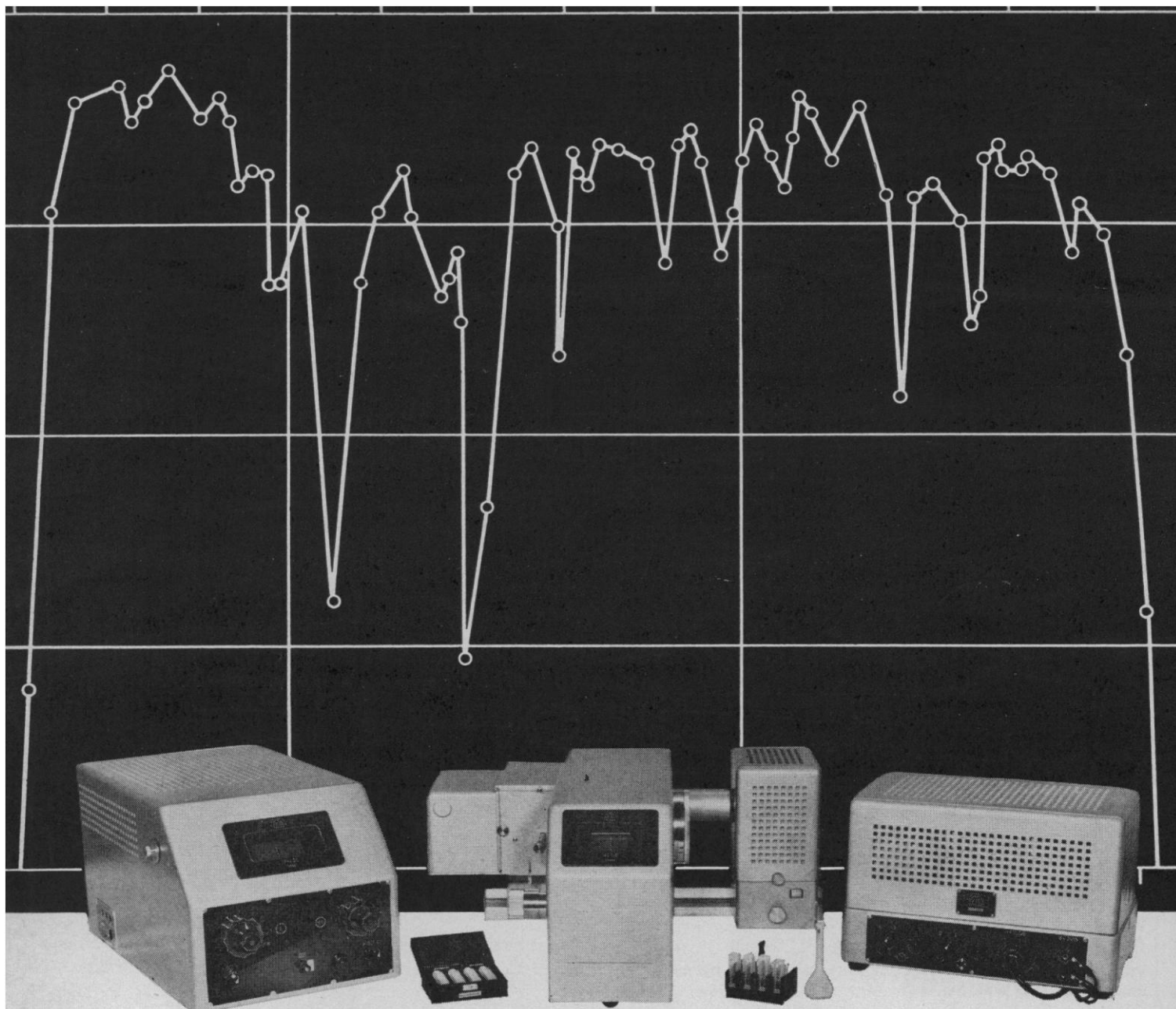
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The material in this section is prepared by the following contributing writers:

Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

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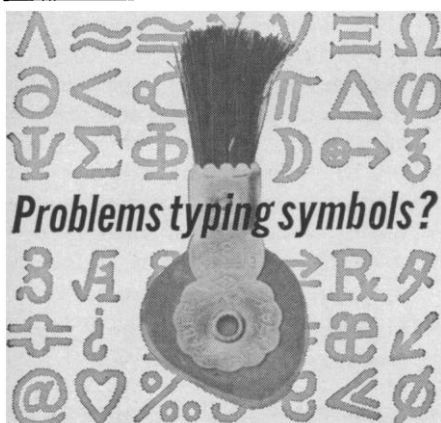
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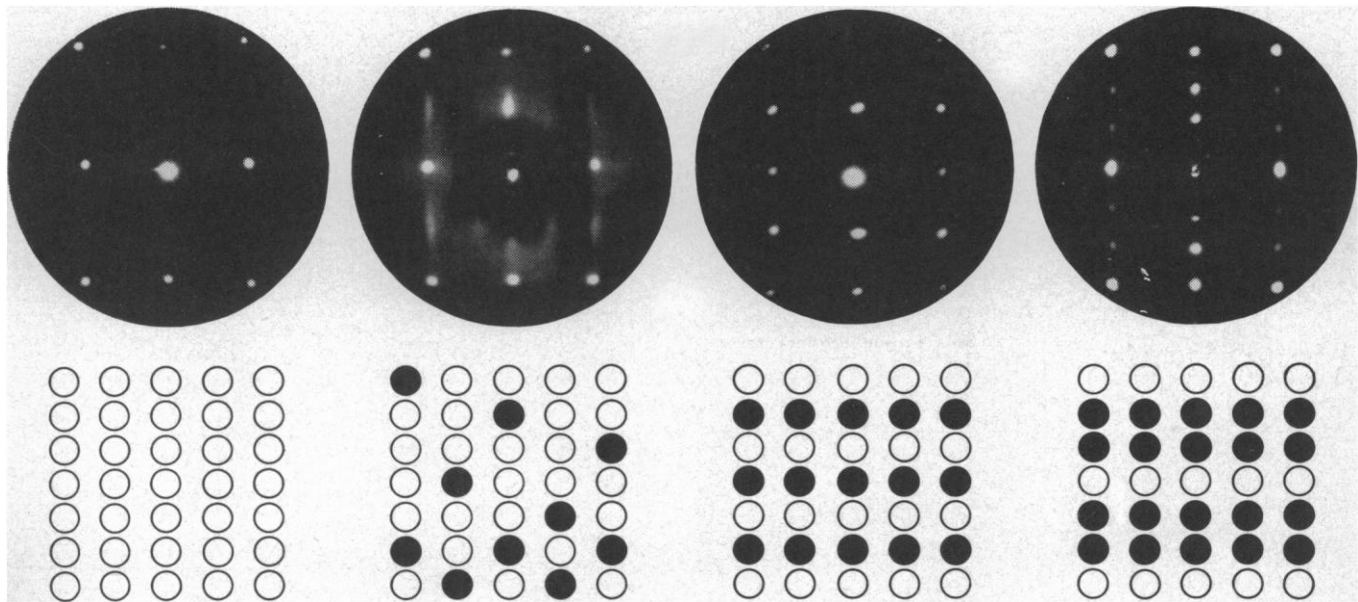
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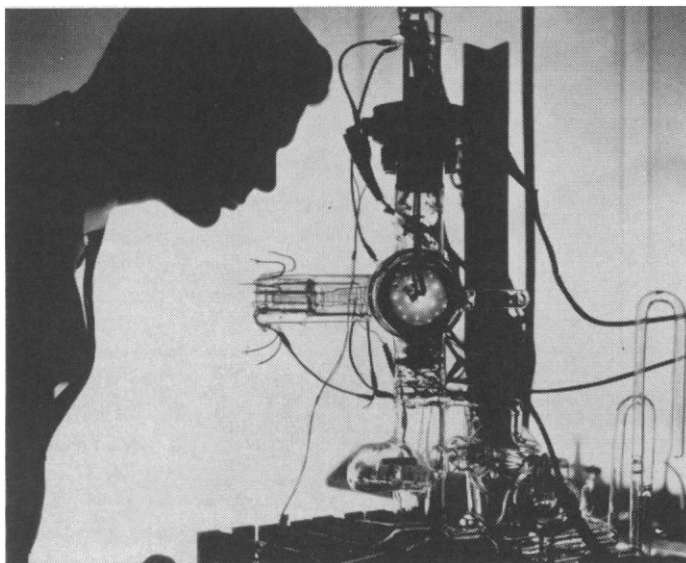
Report from

**BELL  
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Adsorption of oxygen on crystalline nickel surface produces sequence of diffraction patterns shown in upper row. These patterns can be accounted for by the surface atom arrangements in lower row (nickel as open circles, oxygen as filled circles). Clean nickel surface is represented at far left. As oxygen atom concentration increases from left to right, streaks appear (left center), implying random oxygen positions. At  $\frac{1}{2}$  oxygen coverage (right center), surface is ordered and streaks have coalesced into sharp spots halfway between original spots. At  $\frac{2}{3}$  oxygen coverage (right) a triply periodic pattern and atomic arrangement occur.

## A closer look at the surfaces of solids



Low energy electron diffraction equipment showing spot pattern on phosphor screen at center. In this ultrahigh vacuum apparatus electrons are diffracted at the target crystal which can be seen in front of the screen. They are then accelerated to produce visible spots. Electron energy at the crystal surface is variable from near zero to several hundred electron volts.

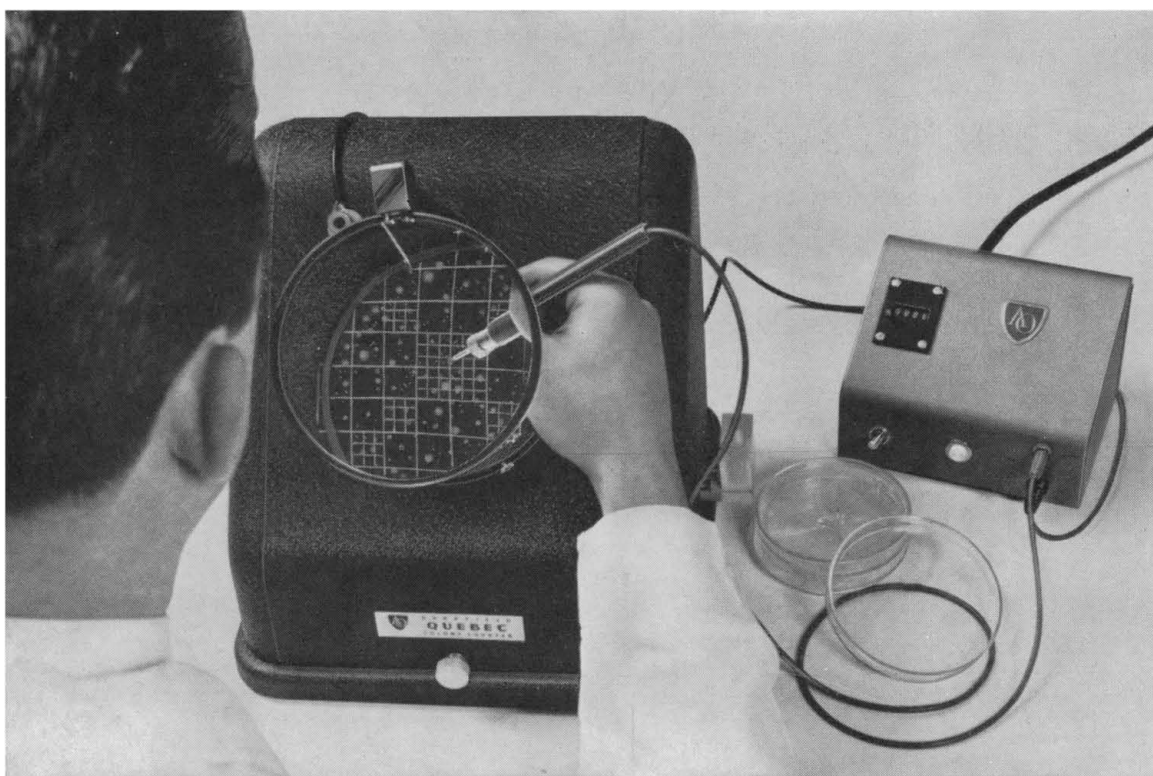
What does a surface really look like on an atomic scale? What happens when a gas interacts with an atomically clean, crystalline surface? With recently improved apparatus (left) based on the scattering of low energy electrons into preferred directions (diffraction), it is now possible to answer such questions in considerable detail.

As an example, scientists at Bell Laboratories have recently observed the intriguing sequence of surface structures illustrated above when oxygen gas interacts with a nickel surface. Structures have been identified and transitions among them studied as functions of gas pressure and temperature on several crystallographic faces of a number of metals, semiconductors and insulators.

Other types of results concern the formation of faceted pits and pyramids at surfaces, nucleation and growth in monolayers and multilayers, and the vibrations of surface atoms. We are working toward fundamental knowledge of surfaces comparable to present knowledge of the bulk properties of crystals.



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