gram is a diagnostic aid of some promise. It may be pertinent to note, however, that the deutan's responses to white do resemble those of R.W.J. in his first experiment.

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6. We have taken data on ourselves with dilated pupils, thus making the Maxwellian-view easier to hold, but we have not found any substantial change in our results; if anything, we find a slight loss in reliability. The Maxwellian-view technique will probably require pupillary dilation in untrained observers.
7. Electrode placement seems very important in this work. We have experimented with many positions and those used here give the best results for our present purposes. They may not do so for other purposes equally restricted to the visual system (for example, field studies). Different positions do work best for different subjects.
8. This is a rectangular plastic pillow filled with tiny glass beads (Flexicast, Picker X-ray Corp.). Upon air evacuation, it takes the shape of whatever is impressed into it and literally locks it in place.
9. M. Rubin, *Amer. J. Ophthalmol.* **52**, 166 (1961). It is possible that observer R.W.J. has some very mild color anomaly not apparent from usual testing procedures, or that he may be at one extreme of the normal range. On the contrary, the observer T.S. is clearly deuteranomalous, but to avoid exact specification of the extent of the deficiency at this time we use the term "deutan."
10. While these observers agree in white at 8 mm, R.W.J. disagrees with A.F. at 5 mm.
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Volume Measurements on Chromium to Pressure of 30 Kilobars

Abstract. *The unit cell volume of chromium was measured as a function of pressure from 1 bar to 30 kilobars by x-ray diffraction techniques. The antiferromagnetic transition occurred at 1.5 kilobars at 29°C, where there is a discontinuity in the slope of the curve for lattice parameter vs. pressure. By electrical resistance measurements the value of* $-\Delta T_N/\Delta P$ *was determined to be 5.9° ± 0.3° per kilobar. At room temperature chromium remains in the body-centered cubic crystal structure from 0 to 55 kilobars.*

A transition in Cr from the antiferromagnetic state to the paramagnetic state (the Neel point, T_N) has long been known and has been of interest to investigators. Bridgman noticed anomalies in certain properties of Cr as a function of pressure, notably in the electrical resistance and compressibility (*1, 2*). However, much of his data are inconsistent with the findings of recent workers, and it has been suggested that the inconsistency is due to the impurity content of his samples and to strains introduced into his pressure system (*3*). Since the time when our work commenced, several notes and articles have been published about Cr under pressure, investigations being made by means of electrical resistance (*3*), neutron diffraction (*4*), and ultrasonic vibrations (*5*). Our work concerns the volume anomaly in Cr at the Neel point.

We measured volume changes by x-ray diffraction techniques. Chromium powder was mixed with polyethylene powder, and the mixture was pressed together to give a sample (about 0.3 mm thick) containing about one absorption length (the thickness of chromium required to reduce the incident beam intensity by $1/e$) of Cr (0.05 mm). Besides providing a sample of workable thickness, addition of polyethylene served to improve the approximation to hydrostatic conditions in the solid pressure-system. This sample was then centered in either a boron-filled plastic tetrahedron or a lithium hydride tetrahedron and placed in the tetrahedral x-ray diffraction press (*6*). Molybdenum Kα radiation was used, and the five most intense lines of the Cr powder pattern, (110), (200), (211), (220), and (310), were monitored. Pressure was determined by means of the bismuth I-II transition at 25.2 kb in conjunction with continuous resistance

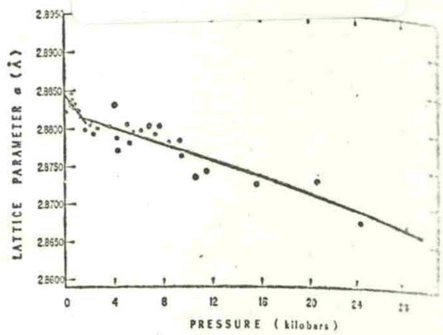

Fig. 1. Lattice parameters of chromium vs. pressure.

measurements of Yb which were related to NaCl compressibility as determined by x-ray diffraction (*7*).

For the determination of the lattice parameter as a function of pressure, the lattice parameters computed from the spacings (measured in two independent runs) of each of the five major Cr lines were averaged at each pressure setting. Thus each point in the curve of Fig. 1 is the average of ten measurements. The uncertainty in lattice parameter is of the order of 0.05 percent in the antiferromagnetic region and 0.10 percent the paramagnetic region. The extremely low compressibility of Cr makes measurement difficult. However, least-square fits of the points from 0 to 2 and from 28 kb show a clear break at 1.5 kb. Our electrical resistance measurements on Cr also indicate a transition (resistance discontinuity) at 1.5 kb. The temperature during the experiments was 29.0° ± 0.5°C. Litvin and Ponyatovskii (*4*), by studies of neutron diffraction and electrical resistance, found the transition at 38°C at atmospheric pressure and found $-\Delta T_N/\Delta P$ to be 5.9°/kb. This would put the transition at about 1.5 kb at 29°C, which is consistent with our data.

In the electrical resistance measurements on Cr we have found the atmospheric pressure Neel temperature to be 38.0° ± 0.5°C, in excellent agreement with the findings of other workers (*3, 4*). From these same measurements we determined $\Delta T_N/\Delta P$ to be 5.9° ± 0.3°/kb, again in agreement with the value of Litvin and Ponyatovskii (*4*) but slightly higher than that of Mitsui and Tomizuka (see *3*), who found 5.1° ± 0.2°/kb.

From the data of Fig. 1 we calculate a bulk compressibility in the antiferromagnetic region of $\beta_0 = 21.8 \times 10$ (dyne/cm²)$^{-1}$. In the paramagnetic region $\beta = 5.60 \times 10^{-13}$ (dyne/cm²)$^{-1}$. The initial compressibility is larger than obtained by Bridgman (*1*), who found

$\approx 6.1 \times 10^{-13}$ (dyne/cm^2)$^{-1}$. How-, it should be noted that the scatter oints in Bridgman's compressibility surements (2) is approximately 3 s that of ours and that Bridgman not detect a break in the compressi- curve. A plot of $\Delta V/V$ against P 0°C as given by Bridgman (1) (he smoothed data at 1-kb intervals) cates that the initial compressibility probably considerably higher than 10^{-13} which is the slope of his between 1 and 12 kb.

n an extended x-ray run in which diffraction pattern was scanned y 5 kb, we found that Cr remains body-centered cubic crystal struc- from 0 to 55 kb at 28°C.

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a-Level Changes during the st 2000 Years at int Barrow, Alaska

Abstract. *Eustatic rises of sea level ween A.D. 265 and 500 and between D. 1000 and 1100 caused the formation of raised beaches. After the first sea level dropped about 2 meters w the present level, permitting Es- o settlement of Birnirk about A.D. . The second rise of the ocean ded Birnirk. At present, sea level is ut 0.6 to 1.0 meter below the high- er levels; the ocean partially floods irk.*

During the summer of 1964 a fossil was found in place in old beach es on Point Barrow, Alaska. Dig- produced two more pieces of drift- d. These specimens were buried in rea where datable material had not n found and where the sediments e among the oldest on Point Barrow.

The samples were dated by radiocarbon methods in an attempt to add to the geologic history of the region. In particular, evidence for changes of sea level and their effect on early Eskimo settlements was desired. The dates should be of interest to scientists of several disciplines because the area has been used for studies in geology, anthropology, biology, limnology, and climatology. These studies are still in progress, and a major attempt is being made to unravel the Pleistocene and Recent history (*1*).

Point Barrow (Fig. 1) is the northernmost point in the United States. It was part of a spit until 3 October 1963, when a major storm breached the spit just northeast of its junction with the mainland. Because these breaks are expected to heal within a few years, the Point Barrow area is still referred to as the Barrow spit. The spit extends northeast from the mainland for a distance of 8 km to Point Barrow. There the spit hooks and curves southeastward for 5 km. In most areas, patterns of beach ridges occur. The sediment forming these ridges has been described by Rex (*2*) and by Péwé and Church (*3*). It is chiefly chert of sand and gravel sizes.

The beach ridges can be grouped into three series (Fig. 1) first recognized by Rex (*2*). The youngest series is actively growing and is on the west; the oldest is on the east. The older two series contain beaches higher than those in the youngest series. Elevations over 4 m above sea level are found along the ridges passing through reference mark No. 2 of the Nuwuk bench mark and Hole No. 4, drilled by Péwé and Church (Fig. 1). The beach ridges in the youngest series reach elevations of 3.5 m but are mostly about 2 m above sea level. In general, within the older two series, the higher beach ridges are on the west. Ice wedges can be found in the older sets of ridges; soil a few centimeters thick has developed on the oldest beaches.

The highest ridges of both older series of beaches are thought to have been formed when sea level was about 0.6 to 1.0 m higher than it is now, for they are about 0.6 to 1.0 m higher than the highest of the younger ridges and the same distance higher than the highest beach ridge built by the storm of 1963. Water from that storm did not wash over the highest older ridges. The storm was stronger and produced a higher sea level than any previously mentioned in Eskimo tales or recorded by others; by conservative estimate, it was the worst storm in 100 years. Its severity was the result of record high winds and an unusually ice-free ocean. Therefore, while there is some possibility that a past storm built beach ridges over 4 m above sea level without a rise in sea level, it seems that a higher sea level is the more likely possibility. Moore also ascribed elevated beach ridges near Point Hope and Cape Kruzenstern to higher stands of sea level (*4*).

The lower beach ridges in the older series may represent either low stands of the sea or ridges which were formed during average storms of the past. The old Eskimo site of Birnirk (Fig. 1), located on beach ridges forming the base of the Barrow spit, is at present partially drowned (*5*). During the occupation of this settlement, the sea must have been lower than it is now. Comparison with a nearby present-day Eskimo settlement suggests that the sea must have been about 2 m below its present level during the occupation of Birnirk. Moore (*4*) also thought that low stands of the sea were demonstrated at Point Hope.

The three pieces of driftwood found in 1964 in the eroded bluffs at Nuwuk were in beach deposits having an average dip of about 3° northwest. The stratigraphic position of each of the samples corresponded with the following ages (*6*): sample GX0380, 1700 ± 110 years ago; sample GX0381, 2365 ± 100 years; sample GX0230, 5575 ± 375 years.

The positions of the specimens were all related to the second reference mark of the Nuwuk bench mark (Fig. 1). The elevation of the top of the marker was taken as 4.2 m above mean low water. The oldest specimen (GX0230) was 22 m north 57° east of the reference mark and 2 m above mean low water. The specimen was a badly weathered log at least 2 m long and about 20 cm in diameter. The log had been split and the bottom was missing. The middle sample (GX0381) was 2.5 cm in diameter and 15 cm long. It was 22 m north 6½° west of the reference mark at an elevation of 1.4 m. Nearby was the youngest piece of wood (GX0380), 3.1 cm in diameter and 21.5 cm long. It was 21 m north 5½° west of the reference mark and 1.7 m above sea level.

All three specimens were found in the same beach ridge (Fig. 1). There was no evidence of a major stratigraphic break in the sediments containing the fossil wood. Hence the entire