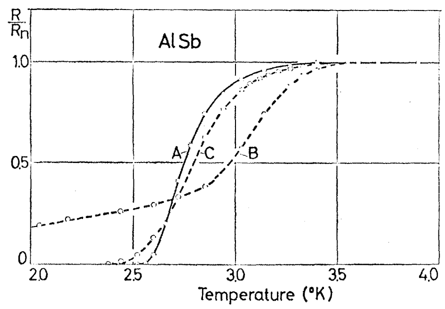

Fig. 2. Normal-to-superconducting transitions of AlSb samples. The letters correspond to the indicated points of Fig. 1.

ple became superconducting, with a very broad transition curve which had a long tail extending to lower temperatures (Fig. 2). Annealing this sample under constant pressure to about 100°C caused further transformation to the metallic state, as evidenced by an irreversible drop in resistance near room temperature which occurred during warming up (vertical dashed line in Fig. 1, ending in point *C*). The sample was again cooled under constant pressure, and as a result of annealing exhibited a much more sharp transition to the superconducting state at about 2.8°K (curve C, Fig. 2).

Previous results on InSb and GaSb (*2*) suggest that the high-pressure metallic phase of AlSb may be quenched at 80°K, if the pressure is cautiously removed at this low temperature. Several experiments completely failed because of blow outs of the interior of the pressure cell when the pressure was released. The use of an overall pyrophyllite-cell (*3*) seems a possible solution to this experimental problem apparently arising from a change in mechanical properties (such as internal friction) of cell materials with temperature. But no successful experiment has been carried out up to the present time.

Metallic AlSb is a superconductor with a critical temperature T_c ($P \simeq 125$ kb) equal to 2.8 ± 0.2°K. As expected from the simple mass rule this transition temperature is higher than that of InSb. For metastable metallic GaSb, values of T_c between 4.2 and 6.0°K under zero pressure are reported, depending on the kind of treatment by heat of the samples before they were quenched at 80°K to zero pressure. A comparison of transition temperatures seems to be reasonable at corresponding points of the isomorphous phase diagrams of these substances, for example, at their different equilibrium transition pressures between the semiconductor and metal stability fields. The pressure dependence of T_c of metallic GaSb and InSb has not yet been determined. A pressure which, in the case of GaSb, is about 70 kb below the equilibrium transition pressure may cause a remarkable shift in T_c. Therefore the reported values of T_c on GaSb cannot be compared with the T_c of AlSb, the latter studied under equilibrium pressure. This argument holds up for metastable InSb too, but the resulting shift in T_c will probably be much smaller because the transformation pressure for this substance is only about 20 kb.

Perhaps another difficulty arises from the fact that T_c values compared were determined by various methods. It seems to me that alternating-field induction methods, often preferred, are, in principle, resistance measurements with a different (that is circular) geometry. Therefore I do not believe that normal-to-superconducting transitions measured by a four-electrode technique differ essentially from results obtained by other methods.

New results have given some impetus to the idea that the superconducting transition temperatures of group IV elements and III-V compounds may be closely related to one another in a simple systematic way. A well-known high-pressure modification of tin has a transition temperature T_c (P = 113 kb) equal to 5.3°K (*3*). Minomura and co-workers (*7*) observed a pressure-induced phase transformation in InSb at about 80 kb which was accompanied by a small increase in resistance quite similar to that in the tin transition (*3*). This new high-pressure modification of InSb presumably has been quenched under the conditions of their experiments and exhibits a high critical temperature T_c ($P = 0$ kb) equal to 4.8°K, once again in analogy to the behavior of the high-pressure modification of pure tin which, indeed, has a higher critical temperature than the ordinary low-pressure modification (*3*).

This picture is, perhaps, an oversimplification of the situation because Kasper and Brandhorst (*8*) found an orthorhombic high-pressure phase near 30 kb for InSb in addition to the well-confirmed tetragonal high-pressure phase. The stability conditions of the various high-pressure modifications (there seem to exist at least three) are not known unambiguously at the present time. Therefore, the above-mentioned comparison of the behavior of Sn and InSb is tentative.

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2 November 1966

Indium as an Impurity in Ancient Western Mexican Tin and Bronze Artifacts and in Local Tin Ore

Abstract. *The presence of indium in a nodule of cassiterite from the State of Guerrero increases the probability that ancient tin and bronze artifacts from Guerrero, which contain indium as an impurity, were made locally from metal extracted from local tin ore.*

At the 35th International Congress of Americanists in Mexico City in 1962, we presented evidence of tin smelting and the use of metallic tin in pre-Conquest Mexico, more specifically in the State of Guerrero (*1*). We noted that our analytical results for two, nearly pure, tin fragments of lip plugs found by D. F. Rubín de la Borbolla in 1957 at Teloloapán near Taxco were very unusual. One fragment containing 99.65 percent Sn had 0.12 percent In as an impurity. The other fragment contained 99.71 percent Sn with 0.09

percent In present as an impurity. The presence of this rare element in relatively high concentrations was so unusual that, out of common prudence, the work was repeated five times by two different methods. Each time, however, the same positive result for indium was obtained. We hazarded the suggestion that indium might prove a diagnostic impurity of tin produced from local ores in ancient times.

The next day at the Congress, Brush discussed a group of pre-Conquest metal artifacts found in coastal Guerrero, a group in which three bronze objects contained indium as an impurity (*2*). Brush also had had the tests repeated with the same positive result for indium. He concluded that it seemed highly probable that the ore from which the tin in our two specimens had been extracted and the ore that supplied the tin for his three indium-bearing bronzes came from the same locality.

Our efforts to obtain cassiterite samples from Guerrero at that time were unavailing. Eduardo Schmitter V of the Institute of Geology of the National Autonomous University of Mexico assured us that *gambusinos* (prospectors and small-scale miners) occasionally found "stream tin" in Guerrero, so we left a standing order for any samples that might turn up.

In July of this year William Spratling, the noted silversmith in Taxco, sent us a nodule with the information that it came from the Cerro el Atache in the mountains quite near the town of Taxco in Guerrero. It weighed 40.7 g, still had quartz crystals from the matrix adherent, and, on chemical analysis, proved to be impure, native stannic oxide. Its reported source and physical appearance indicated "wood tin" rather than "stream tin." The Battelle Memorial Institute made emission-spectrographic analyses. Indium was definitely present as an impurity, although the proportion was less (approximately 0.02 percent) than that in the two fragments of metallic tin from Teloloapán. The important fact is that it was present in a local ore. Furthermore, there is no reason to expect that the proportion of indium in the mineral should correspond exactly with that in tin extracted from it by primitive smelting methods.

"One swallow maketh not summer," but the analysis of this nodule establishes that indium-bearing cassiterite exists in Guerrero, and greatly increases the probability that the artifacts reported in 1962 by us and by Brush were made locally from metal extracted from local tin ore. Also it fully confirms the report Cortés sent to Charles the Fifth in 1524, in which he wrote of pre-Hispanic mining of tin ore in the mountains near Taxco and of his unsuccessful efforts to work those deposits (*3*).

That such deposits have been forgotten and are no longer worked, and that we encountered so much difficulty in securing a specimen of tin ore from Guerrero, should not surprise anyone. The ancient Mexican miners had neither roads nor beasts of burden. They traversed the worst sort of country on shanks' mare and recovered ore from surface outcrops wherever they found it. For example, Hendrichs' diligent and patient search, based in part on an ancient picture writing, showed that early copper mining and ore treatment in Guerrero took place in mountainous regions so inaccessible and remote from modern transport as to render it commercially unsound, if not virtually impossible, to work the ore bodies today (*4*).

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Molluscan Faunal Changes around Bermuda

Abstract. *The recent appearance of large populations of certain adult marine mollusks in Bermuda shallows, unreported in previous surveys, suggests that an invasion is taking place, probably from Florida or the Bahamas, or from both. "Newcomers" grow to sizes larger than any known elsewhere, suggesting that the characteristically large sizes of some species in Bermuda reflect environmental rather than genetic causes.*

During the last 110 years the marine mollusks of Bermuda have been intensively collected and reported upon six times (*1, 2*). They have been collected incidentally almost annually by visiting scientists and amateur shell collectors who have deposited specimens in museums of natural history (*3*). One of us (R.T.A.) made collections in 1934, 1936, 1952, and 1964; the other collected every weekend from 1941 through 1944, and for 3 weeks during each summer from 1959 through 1966.

The large calico clam, *Macrocallista maculata* (Linné, 1758), common from Brazil to North Carolina and the Bahamas, has never been reported alive from Bermuda (*4*), but has been recorded as a fossil (*1, 2*). The first live specimens were collected near The Aquarium, just within the entrance to Harrington Sound, by one of us (R.J.) in July 1961. By 1964 the clams abounded around Trunk, Cockroach, and Rabbit islands in Harrington Sound; by 1965 they were being used for bait and were appearing in the local food markets (*5*).

No one has reported the presence of the colorful, intertidal nerite *Puperita pupa* (Linné, 1767) in Bermuda (*1, 6*). One of us (R.J.) discovered a few specimens in upper-level tidepools in Devonshire Parish in 1964; by 1966 they had spread to other tidepools along a 16-km stretch of Bermuda's south shore.

Another common intertidal gastropod new to Bermuda is the false prickly winkle, *Echininus nodulosus* (Pfeiffer, 1839). Abbott (*7*) could not find this species in Bermuda after a careful search of collections (*3*) and of the literature. One of us (R.J.) found it not uncommon along the south shore from 1964 through 1966. Other species of Littorinidae, such as *Littorina mespillum* (Mühlfeld, 1824), *L. meleagris* (Potiez and Michaud, 1838), *L. nebulosa* (Lamarck, 1822), and *L. lineolata* (Orbigny, 1842), now occur along the south shore, but were not reported in Bequaert's extensive monograph (*8*) or in collections (*3*) existing prior to 1962. Jones (*9*) reported *L. ziczac* (Gmelin, 1791) to be uncommon in 1864; today it is one of Bermuda's most common mollusks. However, the