our results indicated that copper was in equilibrium with metallothionein at $p$H 7.4 after 48 hours. We are currently reexamining copper binding to normal metallothionein and metallothionein from subjects with hepatolenticular degeneration under different experimental conditions.

If, as Scheinberg suggests, copper is bound to metallothionein in the cuprous form, our interpretation of the data is indeed incorrect, and I will take full responsibility for dubious experimental design and incorrect interpretation of results. However, before submitting to Scheinberg's refutation, I would like to see experimental evidence proving that copper is bound in the cuprous form. Scheinberg has stated that "it is *almost* certain that copper is bound as cuprous ions . . ." (italics mine) and referenced experiments demonstrating that copper is reduced by thiols. Scheinberg has overlooked the fact that we are dealing with a unique protein—a protein in which an average of three cysteinyl residues are involved in the binding of each metal atom (*2*). A complex involving three sulfhydryl groups, possibly another electron-pair donor, and a cupric ion would preclude oxidation-reduction and permit equilibrium to be obtained in a solution containing cupric ion. Indeed, cupric complexes with two cysteine molecules have been described (*3*). Thus, the presence of a thiol and a cupric ion does not necessarily dictate oxidation-reduction.

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24 June 1974

## Subsidence of Venice: Predictive Difficulties

In explaining the subsidence of Venice, Gambolati *et al.* (*1*) have presented a very clear description of the importance of the consolidation of compressible soils. The mechanism they describe is a very reasonable theoretical formulation of the well-known consolidation theory of geotechnical engineering. Our purpose in this comment is to amplify the warning of Gambolati *et al.* in their concluding paragraph on possible inaccuracies in the predictions resulting from the lack of data.

It is very difficult to obtain a sample of undisturbed soil or rock at depth, and the accuracy of predictions for the time rate of settlement depends very heavily on the precision with which the properties of the materials can be measured either in the field or in the laboratory. When existing data are examined and the properties computed so as to provide a plausible fit to the already known history of settlement, very good agreement can be obtained. Unfortunately, when the calculations are extrapolated into the future, the fit can become quite precarious. For example, Fig. 1 is a summary of several predictions made for the subsidence at Long Beach, California, associated with oil field pumping. The solid line is the actual history of subsidence at the center of the bowl. The subsidence was stopped at 28 feet (8.5 m) when water was injected back into the field. The dashed lines are the predicted extrapolations made over a period of some 15 years by various well-qualified investigators, most of whom used the consolidation theory. It should be noted that all the predictions in Fig 1 were in error on the unconservative side, that is, too low. Similar difficulties have been experienced when investigators have tried to extrapolate the future behavior of other cases of subsidence due to pumping.

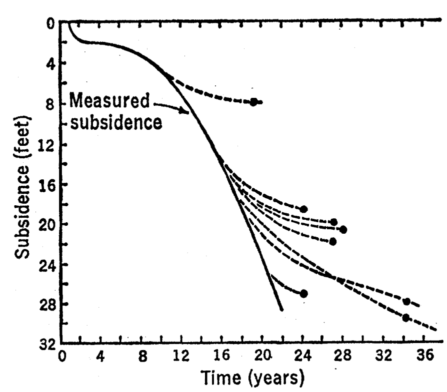


Fig. 1. Predictions made for the subsidence at Long Beach, California, associated with oil field pumping in the Wilmington oil fields.

Errors in predictions like those in Fig. 1 or those in figure 2 of (*1*) can arise from several sources. First, there is the above-mentioned difficulty of obtaining good samples of the soil. Second, details of stratification can strongly affect the time rate of settlement prediction, and such details are not easy to identify over the entire area of the settlement bowl. Third, fluid pressures are usually measured in the wells, where they must have the lowest values anywhere in the region. This leads to an underestimate of the overall fluid pressure distribution and distorts the interpretation of past history. A final cause of possible difficulty is the implicit assumption that the silt below 300 m is incompressible and does not contribute to the settlement. This assumption is questionable, and deformations in this material could throw the predictions off significantly. It would be interesting to know how Gambolati *et al.* have dealt with these problems.

For these reasons, the predictions shown in figure 2 of (*1*) may not be very accurate. Undoubtedly, the continued pumping of water from the wells in Venice will cause increased settlement as the result of the consolidation of the underlying soils, but exactly what shape this settlement curve will take is very difficult to predict. Furthermore, the prediction that stopping pumping will have a specific effect on the amount of settlement is very doubtful. This observation is in no way meant to suggest that the description of the problem, the numerical calculations, or the major conclusions of Gambolati *et al.* are incorrect. Rather it is meant to add emphasis to their own warning that the predictions should be viewed with great skepticism and to point out that in many cases predictions of future settlement have been much smaller than the actual settlement that subsequently occurred.

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9 April 1974