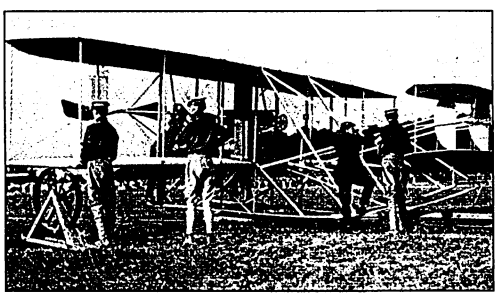
No Prize for the Wrights

THERE ARE MANY DESERVING DISCOVERIES and inventions unrecognized by the award of a Nobel Prize, as noted by David Malakoff (News Focus, "Prizewinners, no—but not losers," 12 Oct., p. 292). One of the most significant omissions not mentioned by Malakoff is sustained, controlled, powered human flight. The Nobel Prize awards began in 1901. The Wright brothers made the first powered flight in 1903.

Orville and Wilbur Wright each received eight nominations for the Physics Prize in 1909. Among their nominators were Poincaré and Mittag-Leffler (*1*). The prize went to Marconi and Braun, so one could hardly argue that there was any prejudice against inventions, particularly since the 1912 award went to Dalén for improving lighthouse illumination. The brothers were again nominated in 1913, although Wilbur had died on 30 May 1912 and there are no posthumous awards.



Orville Wright (black jacket and cap) is testing the struts on the Flyer before its first endurance flight on 27 July 1909.

CREDIT: BETTMANN/CORBIS

ROBERT LANGRIDGE
60 The Crescent, Berkeley, CA 94708–1702, USA.
E-mail: boblangr@socrates.berkeley.edu

References and Notes

1. E. Crawford, J. L. Heilbron, R. Ullrich, *The Nobel Population1901-1937: A Census of the Nominators and Nominees for the Prizes in Physics and Chemistry* (Univ. of California, Berkeley, and Uppsala Univ., Uppsala, Sweden, 1987).

NAS Cloning Hearing Disappoints Participants

THE NATIONAL ACADEMY OF SCIENCES (NAS) is arguably the most important scientific association in the United States. For decades it has been a key source of sound policy advice and solidly grounded opinion on matters pertaining to science, medicine, and engineering to the federal government. Early in August the NAS held a hearing on cloning. The report that will result from that hearing (due by the end of 2001) will no doubt receive keen attention from Congress. How did it happen that on a topic of crucial currency the NAS saw fit to welcome as equals into its ranks a group with so little scientific credibility? And why has the scientific community had so little to say about this puzzling collapse of standards with respect to who is asked to speak publicly on matters of science and medicine?

The group in question is Brigitte Boisselier, Panayiotis Zavos, and Severino Antinori. Boisselier does not have a single Medline or Biosis publication. None of them has produced any Medline or Biosis indexed publications on cloning. None of the three has done any animal experimentation published in any Medline or Biosis indexed publications that would permit them to offer relevant information about the feasibility of cloning (for example, the embryological problems with the reprogramming of gene expression or attempts at animal cloning).

When the leading organization of scientists and physicians in the United States invites unqualified persons to sit as equals meriting the same consideration due to those who actually have conducted responsible research on the topic at issue, and when, as happened at the hearing, those on the fringe are permitted to deprecate the work of those who actually have published research on cloning, then the distinctions between science, pseudoscience, and nonscience (if not nonsense) are eroded. No doubt the testimony of the real experts who were present during the hearing will lead, in the published report, to a resounding condemnation of the claims and assertions of Zavos, Boisselier, and Antinori. But the decision to treat these people as scientific equals in order to hear from them was wrong.

Perhaps the greatest damage that can occur when the scientific community fails to clearly demarcate real science from nonscience is that bad public policy results. Already bills are moving through Congress, in state legislatures, and in international organizations to ban or prohibit all forms of cloning with human DNA, whether for reproduction or any other scientific purpose. Perhaps it is prudent to enact such bans, but there can be little doubt that the rush to enact them is being fueled by the perception that legitimate scientists and doctors are going to clone a human being in the near future.

In a democracy, public policy must be based on more than the views of scientists, even on matters of medicine and science. But the voices of scientists must be heard by those responsible for making policy. What is happening in the discussion of cloning in American public policy, as the NAS panel made sadly evident, is that the scientific community has become too lax about making sure that the public and policy-makers can hear them clearly.

DAVID MAGNUS, ARTHUR CAPLAN*
Center for Bioethics, University of Pennsylvania, Philadelphia, PA 19104, USA.
E-mail: magnus@mail.med.upenn.edu, and caplan@mail.upenn.edu
*Director of the Center for Bioethics

Amplifying Importance of New Research in Peru

THE REPORT BY R. SHADY SOLIS, J. HAAS, and W. Creamer on the early monumental Peruvian site of Caral (Supe Valley) provides important data about early complex society in the Andes ("Dating Caral, a preceramic site in the Supe Valley on the central coast of Peru," 27 Apr., p. 723). However, the short format of *Science* reports did not permit the authors to place the findings in the context of prior research, leading to misrepresentations in media reports, including the accompanying News of the Week article by H. Pringle ("The first urban center in the Americas," p. 621).

Although it is the largest, most complex Late Preceramic site known in coastal Peru, Caral is not the earliest site with monumental architecture and/or remains of domesticated plants (*1*). Near the shore in the Supe Valley, Aspero covers more

than 13 hectares (ha), has 6 major artificial mounds (like Caral) and at least 11 smaller mounds, has dense midden, presents four of the seven domestic plant species reported for Caral as well as maize (though the latter is problematic), and has dates (on the latest construction phases) that begin several hundred years earlier than Caral (*2*). Two other sites in the region, Los Gavilanes (*3*) and Huaca Prieta (*4*), that are contemporary with or earlier

Temple mounds and modern garbage at Aspero, a Late Preceramic shoreline site predating Caral.

than Caral, respectively, have larger numbers of domesticated plants. And located 74 km inland and at 1100 m above sea level, La Galgada (*5*) is also contemporary with Caral, has two large artificial mounds with several others nearby, and contains a similar suite of domesticated plants. All of these sites depended on seafood for the animal component of the diet.

Caral is not the first site to suggest Late Preceramic irrigation agriculture. In 1988, Smith wrote, "La Galgada must have been built by persons supported by irrigation agriculture, because the local area is not suitable for flood-water farming and the climate is too dry to support any form of agriculture other than irrigation" (*5*, p. 138). The argument for irrigation at both sites is indirect and must be supported by field measurement of Late Preceramic flood-watered arable land proximal to the sites.

In her news article, Pringle writes that "Caral now casts doubt on a favorite idea of many Andeanists: the maritime hypothesis of the origins of Peru's civilizations" (MFAC). Moseley proposed MFAC in 1975 (*6*), using data from excavations near Lima to posit a marine subsistence base for early complex society. MFAC also recognized that cultivated cotton and gourd played crucial roles as "industrial" plants, providing the raw materials for clothing, nets, floats, and containers. As new data have come to light, Moseley has modified MFAC (*7*) to incorporate gathered and cultivated plant foods as the source of carbohydrates and other dietary nutrients. The subsistence remains from Caral described by Shady *et al.* indicate clearly that even there, 23 km from the shore, seafood provided the entire animal component of the diet and cotton and gourds were among the most important crops. As Moseley presaged 10 years ago (*7*), Caral is fully consistent with MFAC.

Finally, the temporal priority of monumental architecture, complex organization, and domesticated plant use at Aspero still supports the formative role of marine resources in early Andean civilization and suggests that Caral developed out of this littoral base.

Andean coast dwellers have fished for 13,000 years (*8*). Farming is more recent, and its origins do not appear coastal (*9*). As we (*8, 10*) and others have argued, it is the juxtaposition of these two subsistence systems that provided the base for Peruvian coastal complexity. Shady *et al.*'s discoveries at Caral demonstrate the early power of the resulting civilization and foreshadow the later socioeconomic organization of coastal fishing and farming specialists (*10*).

DANIEL H. SANDWEISS,[1]* MICHAEL E. MOSELEY[2]
[1]Department of Anthropology, University of Maine, Orono, ME 04469–5773, USA. [2]Department of Radiology, Stanford University, Stanford, CA 94305, USA
*To whom correspondence should be addressed. E-mail: dan.sandweiss@umit.maine.edu

References and Notes

1. See supplementary material avaliable at www.sciencemag.org/cgi/content/full/294/5547/1651d/DC1
2. R. A. Feldman, thesis, Harvard University (1980).
3. D. Bonavia, *Los Gavilanes* (COFIDE, Lima, Peru 1982).
4. J. B. Bird, J. Hyslop, M. D. Skinner, *Anthropol. Pap. Am. Mus. Nat. Hist.* **62** (part 1) (1985).
5. T. Grieder, A. M. Bueno, C. E. Smith Jr., R. M. Malina, *La Galgada, Peru A Preceramic Culture in Transition* (Univ. of Texas Press, Austin, 1988).
6. M. E. Moseley, *The Maritime Foundations of Andean Civilization* (Cummings, Menlo Park, CA, 1975).
7. _____, *Andean Past* 3, 5 (1992).
8. D. H. Sandweiss *et al.*, *Science* **281**, 1830 (1998).
9. M. E. Moseley, *The Incas and Their Ancestors* (Thames & Hudson, New York, 1992).
10. D. H. Sandweiss, in *Prehistoric Fishing Strategies*, M. Plew, Ed. (Boise State Univ., Boise, ID, 1996), pp. 41–63.

Response

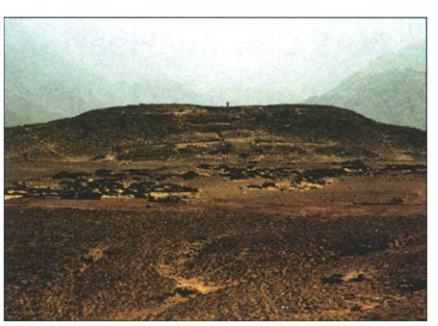
SANDWEISS AND MOSELEY RAISE SOME significant issues that need to be addressed through more research and a more extended exchange in the archaeological literature. However, a number of points will further clarify some of the issues.

Regarding Aspero, the writers say, "Aspero covers more than 13 [ha], has 6 major artificial mounds (like Caral) and at least 11 smaller mounds. . . ." The question here is over qualitative measures versus quantitative measures. Caral covers 65 ha in its central zone, and there is an additional 45 ha of occupied land adjacent to this central zone of mounds and ceremonial structures. We consider the difference between 13 ha and 110 ha significant in defining the urban nature of a settlement.

Concerning the mounds, data indicate that the largest mound at Aspero is only 4 m high and covers an area of 40 m by 40 m (*1, 2*). The other five measurable mounds are smaller. In comparison, at Caral, the smallest of the six mounds mentioned in our report is 10 m high and covers an area of 65 m by 45 m. The largest mound is 160 m by 150 m in area and 18 m high. There are ~20 additional mounds at Caral that are the same size or larger than the largest mound at Aspero. The "smaller mounds" mentioned by Sandweiss and Moseley at Aspero are of a size that is included as residential architecture at Caral. Furthermore, the other four sites in the area around Caral have numerous mounds of a similar magnitude. Twelve inland preceramic sites in the Supe Valley have monumental architecture larger than anything found at Aspero. Compared with the other preceramic sites in Supe (and newly recorded inland sites in the adjoining valleys of Pativilca and Fortaleza), Aspero was a tertiary residential center with minor public architecture.

As noted in our Report, the coastal site of Aspero has radiocarbon dates that precede the earliest dates at Caral, and there are numerous small fishing villages up and down the Peruvian coast, many with dates earlier than Caral and Aspero. On the other hand, whether Aspero and its communal architecture predate all of the inland sites is an open question. There are 18 preceramic sites in the Supe Valley and at least that many in the immediately adjacent Pativilca and Fortaleza valleys. Aspero may prove to be older than all of these inland sites, but at this point, on the basis of suites of dates from only two sites, it is premature to argue for the temporal priority of communal construction at the one fishing village in the entire settlement system.

The critical question raised in the letter is whether the fishing villages on the Peruvian coast laid the "foundations of Andean civilization" (*1, 3*), as Moseley has argued. At the core of MFAC is the idea that centralization, hierarchy, and social complexity arose



Piramide Mayor, the largest platform mound at Caral, with a field assistant standing on top to provide scale.

CREDIT: (LEFT) DANIEL H. SANDWEISS/UNIVERSITY OF MAINE; (RIGHT) JONATHAN HAAS/THE FIELD MUSEUM

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted by e-mail (science_letters@aaas.org), the Web (www.letter2science.org), or regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

in the context of the coastal fishing villages, largely independently of systematic agriculture. The data relevant to this issue are less ambiguous than the dates. As Sandweiss and Moseley point out, Aspero has domesticated plants going down into its lower levels. The cotton used in making the nets is also a domesticated crop. Because these nets are essential for exploiting the abundant anchovy populations on the coast, the maritime fluorescence discussed by Moseley is agriculture dependent from the beginning. At the time Aspero was excavated, before Caral and other inland sites were recognized as having early occupations, it seemed reasonable to propose that these agricultural resources came from simple floodplain agriculture. This proposal is no longer viable. The dominance of marine resources in the food remains at Caral and the combination of domesticated plant remains at Aspero demonstrate that the preceramic people in the Supe Valley had a mixed economy. The fishermen of Aspero were as dependent on the inland farmers for plant resources as were the inland farmers dependent on coastal fishermen for their protein resources.

Whether the exploitation of marine resources played a "formative role" in the development of complex society in the Andes is at best uncertain. The new dates from Caral and emerging data on other inland sites require a comprehensive reassessment of both the chronology and economic organization of the Supe Valley and its immediate neighbors. The origins of complex society in the Andes now appear to be economically quite similar to other world areas with an agricultural foundation and extensive economic interaction between different subregions.

JONATHAN HAAS,[1] WINIFRED CREAMER[2]

[1]The Field Museum, 1400 South Lakeshore Drive, Chicago, IL 60606, USA. E-mail: jhaas@fieldmuseum.org. [2]Anthropology Department, Northern Illinois University, DeKalb, IL 60115, USA. E-mail: wcreamer@niu.edu

References and Notes

1. M. E. Moseley, *The Maritime Foundation of Andean Civilization* (Cummings, Menlo Park, CA, 1975).
2. R. Feldman, thesis, Harvard University (1980); R. Feldman, in *Early Ceremonial Architecture in the Andes*, C. B. Donnan, Ed. (Dumbarton Oaks, Washington, DC, 1985), pp. 71–92.
3. M. E. Moseley, *The Incas and Their Ancestors* (Thames & Hudson, New York, 1992); *Carolina Biology Reader 90* (Carolina Biological Supply, Burlington, NC, 1978).

CORRECTIONS AND CLARIFICATIONS

PERSPECTIVES: "The race to beat the cuprates" by E. Dagotto (28 Sept., p. 2410). The statement that T_c may be increased by increasing the lattice spacing, since the electronic pair binding is an intramolecular property, has already appeared in S. Chakravarty, M. Gelfand, S. Kivelson, *Science* **254**, 970 (1991). See also P. Lammert *et al.*, *Phys. Rev. Lett.* **74**, 996 (1995), and references therein. The author apologizes for this omission.

NEWS OF THE WEEK: "Hopkins reviews investment in Indian cancer drug trial" by P. Bagla and E. Marshall (10 Aug., p. 1024). In the diagram of tetramethyl nordihydroguairetic acid, the "methyl" groups on the chemical structure should have been labeled "MeO" to indicate the presence of an oxygen atom.