

## Retraction

**WE WISH TO RETRACT OUR REPORT "REQUIREMENT OF VOLTAGE-GATED CALCIUM CHANNEL  $\beta_4$  SUBUNIT FOR T LYMPHOCYTE FUNCTIONS" (1).** The conclusions of our paper were based in part on electrophysiological data. We now believe that the data in Fig. 4B (prepared by S.B.) are erroneous, and that the conclusions of the electrophysiological results cannot be relied upon. In the interests of scientific integrity and the scientific literature, we believe the appropriate response is to retract this paper in its entirety.

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### Reference

1. A. Badou *et al.*, *Science* **307**, 117 (2005).

## Human Embryonic Stem Cells

**THE RECENT TRIAL IN THE PRESS OF THE ETHICS** and scientific validity of publications on human somatic cell nuclear transfer ("Evidence of a pluripotent human embryonic stem cell line derived from a cloned blastocyst," W. S. Hwang *et al.*, 12 Mar. 2004, p. 1669; "Patient-specific embryonic stem cells derived from human SCNT blastocysts," W. S. Hwang *et al.*, 17 June 2005, p. 1777) highlights the hopes people place in this emerging area of science to meet therapeutic needs and the high standards the scientific community must bring to the field.

Accusations made in the press about the validity of the experiments published in South Korea are, in our opinion, best resolved within the scientific community. In 1998, following the publication of success in producing a cloned mammal using somatic cell nuclear transfer (1), there were accusations that it was a scientific fraud. In response to these charges, Sir Alec Jeffreys of the University of Leicester offered to independently verify that the animal was indeed a clone by directly obtaining source tissue from the Hannah Research Institute and blood from Dolly. Sir Alec's laboratory then performed DNA fingerprinting and

microsatellite analysis confirming that Dolly's DNA, that of the cells banked at the Institute, and the original adult tissue were one and the same.

It may not come as a surprise that, in a similar vein, charges of fraud would be levied against Hwang's laboratory. We welcome the facts that Hwang has called for an assessment of the work in his laboratory and that the National University has started to make the arrangements. As we (I.W. and K.C.) confirmed the validity of our work by cooperating with an independent study, we encourage Hwang's laboratory to cooperate with us to perform an independent test of his cell lines to determine their nuclear and mitochondrial genotype in comparison with the donors of the original cells.

“ Accusations made in the press about the validity of the experiments published in South Korea are ... best resolved within the scientific community.”

—WILMUT ET AL.

Many patients and family members of patients with degenerative diseases place great hopes in regenerative medicine. This trust and the monies that many public agencies are investing in the science underscore the sobriety the scientific community should bring to the publications of scientific results. In addition to a willingness to facilitate the independent verification of published results, it may be helpful to institute an Internet database to publish the DNA fingerprinting and microsatellite data on new lines to ensure against the cross-contamination of cell cultures or scientific misconduct.

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### Reference

1. I. Wilmut *et al.*, *Nature* **385**, 810 (1997).

*Editor's Note:* As we went to press, Hwang had stated his intention to retract the 17 June 2005 paper.

## Inka Accounting Practices

**WE ARE DELIGHTED THAT G. URTON AND C. J. BREZINE** have discovered concrete examples

of khipus indicating the existence of an accounting hierarchy similar to those previously postulated ("Khipu accounting in ancient Peru," Reports, 12 Aug., p. 1065). Nevertheless, we would like to amplify various points raised by their Report.

We were surprised that the authors recounted the theory of the Inka administration's decimal

structure without mentioning works that express serious doubts about the concrete application of this kind of administration at the regional level (1–4). It appears that the system was rarely exact even when a decimal vocabulary was used (5–7). The population of the Inka province of Huayla, for example, consisted of 12 guaranga (the Quechua term for a group of 1000), which were split into 4 units of 3 guaranga. Yet, on the eve of Spanish conquest, two of the guaranga in a known unit had approximately 750 taxpayers and one had 950 (5).

Urton's and Brezine's discovery of identical khipus accords well with previous accounts of exact copies of khipus shown to Spanish administrators and judges in the 16th century (8, 9). Nevertheless, Spanish transcriptions and translations of khipus do not support Urton and Brezine's hypothesis that the khipu system was flexible, tolerating inexact counts and matches. Colonial testimonies argue unanimously for the exactitude of the system (10).

We have demonstrated previously that when khipus were read, every now and then  $\pm 1$  errors occurred on whichever decimal level (10). Nevertheless, we consider it unlikely that almost half of the summation numbers would have been encoded erroneously, as proposed for khipu UR068. There may be various explanations other

than that of Urton and Brezine for the closeness of the summation numbers. In early colonial khipus, this kind of variation can be found, for example, in the annual fulfillment of earlier taxation requirements known as the Spanish *tasa* (10).

Finally, Urton and Brezine argue that the khipus of the upper hierarchy include place identifiers. Indeed, toponyms and personal names have previously been treated as part of khipu texts (2, 11). We also have argued that the main towns of the Inka State had specific numeric values that were encoded in khipus, and furthermore, that more complicated systems seem to have been used to encode the names of minor villages and the many personal names that appear in various decoded khipu texts in Spanish historical records (5, 10). To us, it seems that Urton and Brezine have applied our hypothesis to their specific case. Unfortunately, they do not manage to prove anything and the statement continues to be an unproven hypothesis.

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#### References and Notes

1. Å. Wedin, *El sistema decimal en el imperio incaico: Estudio sobre estructura política, división territorial y población* (Insula, Madrid, 1965).
2. J.V. Murra, *Formaciones económicas y políticas del mundo andino* (Instituto de Estudios Peruanos, Lima, 1975).
3. F. Salomon, *Native Lords of Quito in the Age of the Incas* (Cambridge Univ. Press, Cambridge, 1986).
4. C. Julien (9), however, has argued that in the Lupaca province, in the South, the Aymara population was grouped into guaranga. Whether her interpretation is correct or not, the actual size of a supposed guaranga oscillated in that province between 866 and 1804 adult men, according to the transcription of an Inka khipu (8).
5. M. Pärssinen, *Tawantinsuyu. The Inca State and Its Political Organization* (Societas Historica Finlandiae, Helsinki, 1992).
6. M. Rostworowski, *Señoríos indígenas de Lima y Canta* (Instituto de Estudios Peruanos, Lima, 1978).
7. M.A. Cornejo Guerrero, *Arqueológicas* 24, 149 (2000).
8. C. Diez de San Miguel, *Visita hecha a la provincia de Chucuito (1567)* (Casa de la Cultura, Lima, 1964).
9. C. J. Julien, *Ethnohistory* 35, 257 (1988).
10. M. Pärssinen, J. Kiviharju, *Textos Andinos: Corpus de textos khipu incaicos y coloniales, Tomo I* (Instituto Iberoamericano de Finlandia and Universidad Complutense de Madrid, Madrid, 2004).
11. J. H. Rowe, *Histórica* 9, 193 (1985).

#### Response

PÄRSSINEN AND KIVIHARJU'S COMMENTS and references point out a number of important issues we were unable to cover in our Report because of space constraints.

It is our understanding that both precise decimal administration and variations on this concept existed in the Inka empire. Colonial informants, especially those in the former capital Cusco (1–4), presented decimal administration as a complete, ideal system, although it is clear that the reality in the provinces was quite different from that ideal. Pärssinen and Kiviharju question the inaccuracy of the Puruchuco khipu; it is our belief

## 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 through the Web ([www.submit2science.org](http://www.submit2science.org)) or by 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.

that such inaccuracy is precisely the sort of variance from ideal decimal values that may have characterized Inka decimal administration at the provincial or local level. The principal task in interpreting pre-Hispanic and colonial record keeping in the Andes remains one of attempting to understand the causes and the significance of differences between colonial informants' testimony about Inka administration in comparison to the information actually recorded (often from khipu transcriptions) in colonial censuses and other statistical records. While we were not surprised that the decimal ideal was not reflected in the numbers and sums recorded in the Puruchuco khipu, we still believe that describing the ideal is essential to gaining a full picture of Inka administrative practices.

Although much of the material discussed in our Report is based on analysis of numerical values on the khipu, we were led to that analysis through other structural similarities within this group of artifacts: pendant cord spacing, color repetitions, and relative position of numerical magnitudes within their pendant groups. Therefore, our hypothesis of an accounting hierarchy is not based solely on the numbers, which indeed do not represent exact summations between levels I and II.

We regret that we did not specifically mention work on the referencing of toponyms and personal names in the khipu (5, 6), and we appreciate the inclusion of additional references in their Letter.

Finally, we take this opportunity to remind readers that complete data on all of the khipu discussed in our Report are available on our Web site, <http://khipukamayuu.fas.harvard.edu/>.

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#### References and Notes

1. B. Cobo, *History of the Inca Empire* [1653] (Univ. of Texas Press, Austin, TX, 1979) (see especially pp. 198–202).
2. Polo de Ondegardo, in *Colección de Libros y Documentos Referentes a la Historia del Perú*, vol. 4, H. H. Urteago, Ed. (Imprenta y Librería Sanmarti y Ca, Lima, Peru, 1917), pp. 45–94 (see especially p. 51).
3. C. J. Julien, in *The Inca and Aztec States, 1400–1800*, G. A. Collier, R. I. Rosaldo, J. D. Wirth, Eds. (Academic Press, New York, 1982), pp. 119–151.

4. M. Rostworowski, C. Morris, in *The Cambridge History of the Native Peoples of the Americas*, vol. III, *South America*, part I, F. Salomon, S. B. Schwartz, Eds. (Cambridge Univ. Press, Cambridge, 1999), pp. 769–863 (see especially pp. 811–812).
5. M. Pärssinen, *Tawantinsuyu. The Inca State and Its Political Organization* (Societas Historica Finlandiae, Helsinki, 1992).
6. M. Pärssinen, J. Kiviharju, *Textos Andinos: Corpus de textos khipu incaicos y coloniales* (Instituto Iberoamericano de Finlandia and Universidad Complutense de Madrid, Madrid, 2004).

## Highlighting the STAR Collaboration

### THE MEMBERS OF THE STAR COLLABORATION

at the Relativistic Heavy Ion Collider (RHIC) were disappointed by the article “Dueling experiments close in on source of proton’s spin” (A. Cho, *News of the Week*, 4 Nov., p. 757). The article provides a description of the recent results from the PHENIX and COMPASS experiments on the contribution that gluons make to the spin of the proton but does not mention that the STAR experiment has yielded important, complementary new results that bear directly on this question as well.

STAR, like PHENIX, measures asymmetries in high-energy polarized proton collisions. The STAR results, like the PHENIX and COMPASS results, argue against the extreme model that the gluons in the proton are fully polarized.

In the language of perturbative quantum chromodynamics (pQCD), the STAR and PHENIX measurements involve the same initial states—a mixture of quark+quark, quark+gluon, and gluon+gluon collisions—but different final states. Interpreting jet asymmetries such as those measured by STAR introduces less theoretical uncertainty regarding final-state effects. Furthermore, the STAR results extend to considerably higher transverse momentum, where the applicability of pQCD for interpreting the observed spin asymmetries is believed to be quite reliable. In contrast, the reported PHENIX and COMPASS measurements that provide the greatest discriminating power among competing models of the proton involve rather low transverse momentum pions and quite low momentum transfer di-hadrons, respectively, where questions still remain regarding the reliability of the corresponding pQCD calculations that have been performed to date.

All three experiments are complementary. Each involves a unique mix of theoretical uncertainties, so the fact that they lead to a consistent conclusion is far more convincing than is the case for any subset of them.

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