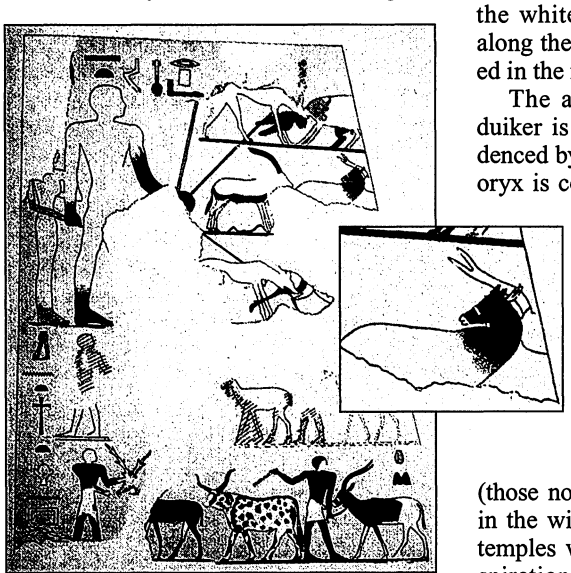
Were There Duikers in Ancient Egypt?

A MURAL LOCATED ON THE NORTHERN SIDE of the wall in Atet's tomb in Meidum, Egypt, dating from the 4th dynasty (~2561 to 2450 B.C.) depicts a hunting scene with an animal figure that closely resembles a duiker (*1*). Today, there are 14 species of duiker (a type of antelope), which inhabit central Africa. On the second pigeonhole from the top of the mural are two bovines (see the figures). A scimitar-horned oryx is on the left, recognizable by its long twisted horns. On the right, with its head turned back to look at the oryx and the hunter, is the upper half of an animal whose head strongly resembles that of a duiker. Indeed, the shape of the bust and head places it in the bovine family, whereas the shape and length of the horns, which are simple and not longer than the ears, places it in the duiker genus *Cephalophus*.



A hunting scene and enlargement of the duiker figure from a mural in Atet's tomb.

CREDIT: CLICHÉ BIBLIOTHÈQUE D'ART ET D'ARCHÉOLOGIE JACQUES DOUCET, PARIS

Such a depiction is surprising, for this genus has never been classified in the fauna of ancient Egypt (*2*). In fact, this bovine and this country seem to be mutually incompatible because duikers lead a life hidden in the thickets of the wooded regions of central Africa, and the only species that live in the prairies and brush are sub-Saharan.

The duiker in this mural resembles the Jentink species, *Cephalopus jentinki* (Thomas, 1892), which prefers dense forests and thickets and is currently only found in a small region in Liberia and the Ivory Coast. It is the only species that has, like the animal in the mural, a dark brown head and neck with a belly, mane, and top length of the tail that are slate gray. The inside of its ears are off-white, like those of the animal in the mural. Jentink duikers also have white on their muzzle, although the white is around the nose instead of along the middle of the muzzle, as depicted in the mural.

The animal figure that resembles a duiker is part of a realistic drawing, evidenced by the fact that the scimitar-horned oryx is correctly drawn, as is the tethered addax on the bottom right of the mural. The white blazes drawn on the muzzles of the addax and the duiker seem signs of the artist's concern for precision. The fact that the animals are realistically represented suggests that the artist observed them first-hand.

It is known that animals (those not found today in Egypt) depicted in the wild in murals in ancient Egyptian temples were not the result of foreign inspiration, because the Egyptians did not seek models outside of their country. Furthermore, this mural cannot represent a foreign scene because of the presence of the addax and the scimitar-horned oryx, which indicates the scene is from a region within the limits of what is presently the Sahara and the Sahel. Neither could the scene have been from a hunting park, for delineated grounds were not necessary at the time because game was in relative abundance. What is more, the evidence for the existence of such parks in ancient Egypt is subjective (*3*). In any case, it is highly unlikely that a member of the Jentink species would have been imported, because the ancient Egyptians are not known to have been in contact with central African populations. On the other hand, Meidum is located a few kilometers from the Fayoum oasis. Before the Middle Empire, this oasis was still covered by thickets teaming with wild animals and was used for hunting. One could well imagine that hunters went to this oasis to hunt duikers. The duiker represented in the mural on Atet's tomb and the considerations discussed above suggest that an isolated nucleus of a Jentink duiker population persisted in ancient Egypt, situated north of the other duiker populations.

NICOLAS MANLIUS
Laboratoire d'Ethnobiologie-Biogéographie du Muséum National d'Histoire Naturelle de Paris, 57, rue Cuvier, 75231 Paris Cedex 05, France. E-mail: ethnobio@mnhn.fr

References and Notes
1. W. M. Flinders Petrie, *Medum* (Nutt, London, 1892).
2. D. J. Osborn and J. Osbornova, *The Mammals of Ancient Egypt* (Aris & Phillips, Warminster, UK, 1998).
3. N. Manlius, *Mamm. Rev.* **30** (no. 1), 65 (2000).

Newest Member of the NIH Family

THE LATEST ADDITION TO THE NATIONAL Institutes of Health's (NIH) 24 institutes and centers—the National Institute of Biomedical Imaging and Bioengineering (NIBIB)—was signed into law by former president Bill Clinton on 29 December (H.R. 1795, Public Law 106-580). Establishment of NIBIB represents the culmination of efforts over recent years, first, from the imaging and bioengineering communities, which have through the organizations that we represent focused attention on research in our disciplines, and second, from the NIH leadership, who have increased support for biomedical imaging and bioengineering research.

Under the initiatives of former Director Harold Varmus, Acting Director Ruth Kirschstein, and Deputy Director Wendy Baldwin, the NIH established the Bioengineering Consortium (BECON) in 1997 and the Biomedical Information Science and Technology Initiative Consortium (BISTIC) in 2000. These organizations facilitate cooperation among institutes and develop research agendas in these fields. At the National Cancer Institute, Director Richard D. Klausner created the Biomedical Imaging Program to expand the size and scope of cancer imaging research. The

NIH Center of Scientific Review, directed by Ellie Ehrenfeld, has established processes to ensure appropriate review of multidisciplinary proposals. Finally, in response to a congressional directive in the fiscal year 2000 NIH Appropriations Act, the NIH is establishing an Office of Bioengineering, Bioimaging, and Bioinformatics (*Science*, 22 Sept., p. 2015).

Through these efforts, the NIH leadership recognized the increasingly central role of imaging and bioengineering in biomedical research. While imaging scientists and bioengineers applauded these initiatives, they also saw the need for an institute to provide permanent support for research in these and related disciplines.

Passage of H.R. 1795 reflects congressional concurrence with that view. In establishing the NIBIB, the director of NIH is authorized to use appropriate physical facilities and to obtain personnel and administrative support from other NIH institutes and centers. In this regard, we should not lose sight of the field's interdisciplinary nature. Certain imaging and bioengineering research efforts must be closely integrated with approaches pursued in other NIH institutes and centers. These institutes/centers, therefore, should retain sufficient resources to continue efforts in imaging and bioengineering that are integral to their missions. The NIBIB, on the other hand, should be devoted primarily to basic and applied biomedical imaging and bioengineering research and training that are likely to have applications to a wide range of disease processes and organ systems. The new institute should strengthen and complement (not subtract from or substitute for) research programs in the other NIH institutes and centers.

The Academy of Radiology Research (*1*) and the American Institute for Medical and Biological Engineering (*2*) are committed to assisting in the creation of the NIBIBE in accordance with these principles. Establishment of the NIBIB is a critical step to develop new concepts, techniques, and technologies for the new century and to integrate the vast amount of biomedical research findings, thus allowing the NIH to accomplish its mission of increasing knowledge to improve people's health and well-being.

SHU CHIEN,[1]* C. DOUGLAS MAYNARD[2]†
[1]Whitaker Institute of Biomedical Engineering, Science Engineering Research Facility, University of California, San Diego, La Jolla, CA 92093–0427, USA; e-mail: shuchien@ucsd.edu. [2]Wake Forest University School of Medicine, Winston-Salem, NC 27157, USA; e-mail: dmaynard@wfubmc.edu
*President, American Institute for Medical and Biological Engineering
†President, Academy of Radiology Research

References and Notes
1. The Academy of Radiology Research is an alliance of 24 professional societies with more than 35,000 members and supporting organizations with more than 87,000 members.
2. The American Institute for Medical and Biological Engineering (AIMBE) is an alliance organization for medical and biological engineering that consists of 15 professional societies (with more than 32,000 members), 69 academic programs (with their faculty and students), 650 Fellows who are leaders in the field, and an Industrial Council. This letter has valuable inputs from members of the AIMBE Board.

Math Melodrama Rings of Reality

CHEERS TO D. F. WALLACE for his spirited, witty, and informative review of the fictional "Math Melodrama" novels by Philibert Schogt (*The Wild Numbers*) and Apostolos Doxiadis (*Uncle Petros & Goldbach's Conjecture*) (*Science*'s Compass, 22 Dec., p. 2263). Cheers also to *Science* itself for conveying at some length and with considerable fidelity, through Wallace, some insights into the joys and anxieties associated with attempted sustained mathematical research.

FIT father Kurt Gödel and friend Albert Einstein in 1950.

In his review, however, Wallace slightly misrepresents the thrust of Kurt Gödel's First Incompleteness Theorem (FIT); further, Wallace uses unduly harsh language in note 17 when he criticizes Doxiadis for allowing his mathematically savvy protagonist Petros to fear that his chosen problem, the Goldbach Conjecture, may be "one of the [FIT's] formally unprovable propositions." "This is so implausible and reductive as to be almost offensive," writes Wallace. And later: "To believe that the [FIT] could apply to actual number-theoretic problems like the Goldbach Conjecture is so crude and confused that there is no way that a professional mathematician of Petros's attainments could possibly entertain [the thought]." FIT asserts that in any sufficiently rich, effectively axiomatizable first-order system (*1*), say first-order Peano Arithmetic, some first-order assertions will be undecidable, in the sense that they are true in some models of that system and false in others. In any given model, any (first-order) statement is true or false; it is the challenge of mathematics to determine in specific cases just which of the two it is, using any legitimate (not necessarily first-order) methods of proof. The character Petros is worried that the Goldbach Conjecture, a first-order statement in the system N of natural numbers (this is the so-called standard model of Peano Arithmetic), might be true in N but not provable by the (permissible, first-order) methods of Peano Arithmetic. We do not know, of course, whether the Conjecture is true in N or false in N (*2*). But Petros's worry strikes us (at the very least) as plausible or reasonable, not as crude or confused.

Furthermore, contrary to Wallace's statement that "the formally unprovable propositions [that FIT] succeeds in deriving are all very special self-reference-type cases," by no means is every statement known to be independent of Peano Arithmetic weird, contrived, or artificial. The combinatorial statement attributed to J. Paris (*3*), as well as the number-theoretic statement of Goodstein's Theorem and the graph/game-theoretic statement of "Hercules and the Hydra" (*4*), are natural mathematical statements that are easy to formulate (in a first-order way), and they are unprovable in Peano Arithmetic but nevertheless true in N. These and other non–self-referential propositions are discussed, for example, in (*5*) and (*6*).

W. WISTAR COMFORT, PHILIPP ROTHMALER
Department of Mathematics, Wesleyan University, Middletown, CT 06459, USA. E-mail: wcomfort@wesleyan.edu; prothmaler@wesleyan.edu

References and Notes
1. Here, first-order refers to number-theoretic statements that are formulated in the logic involving the usual connectives such as "and," "or," and "not," as well as quantifiers; the latter, however, may be applied only to numbers (as opposed to sets of numbers, as in second-order arithmetic).
2. If by chance the Goldbach Conjecture should turn out to be false (in N), it would be false in all models of Peano Arithmetic, and hence, by Gödel's Completeness Theorem, refutable in Peano Arithmetic. Hence, if the Conjecture is independent of Peano Arithmetic, then it is true in N.
3. J. Paris and L. Harrington, in *Handbook of Mathematical Logic*, J. Barwise, Ed. (North-Holland, Amsterdam, 1977), pp. 1133–1142.
4. L. A. S. Kirby and J. Paris, *Bull. London Math. Soc.* **14**, 285 (1982).
5. R. Kaye, *Models of Peano Arithmetic*, vol. 15 of *Oxford Logic Guides* (Clarendon Press, Oxford, 1991).
6. Z. Adamowicz and P. Zbierski, *Logic of Mathematics* (Wiley, New York, 1997).

Response

THE REVIEWER HEREBY WINCINGLY ACKNOWLedges that Comfort and Rothmaler make a good point. It's maybe possible to niggle with them about whether Doxiadis's Petros is actually freaked about the Goldbach Conjecture's undecidability per se or rather just about the possibility that it's "true but independent"—first, because there's no evidence that Petros knows anything about different models of first-order math (the book