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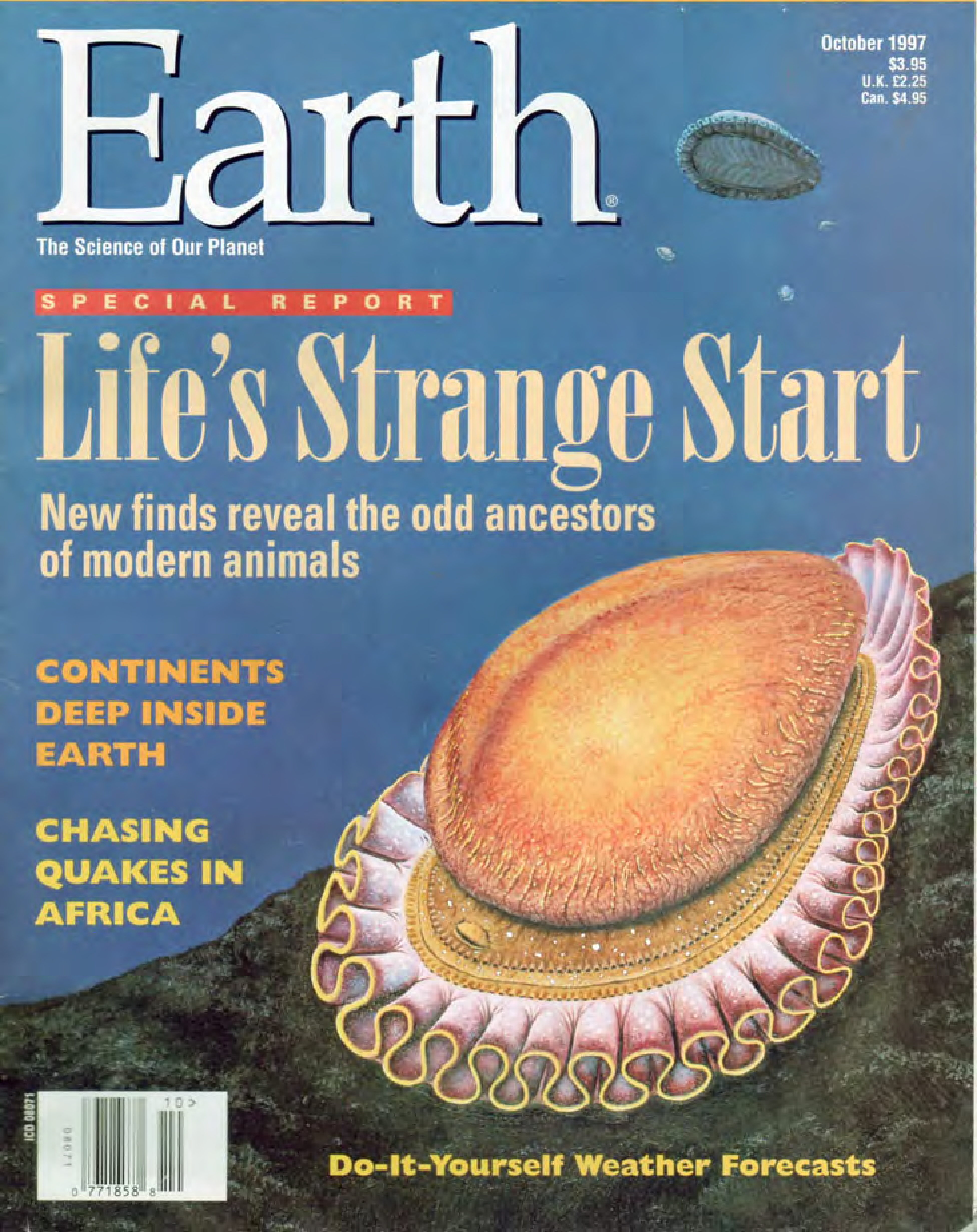

SPECIAL REPORT

Life's Strange Start

New finds reveal the odd ancestors of modern animals

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Battle of the

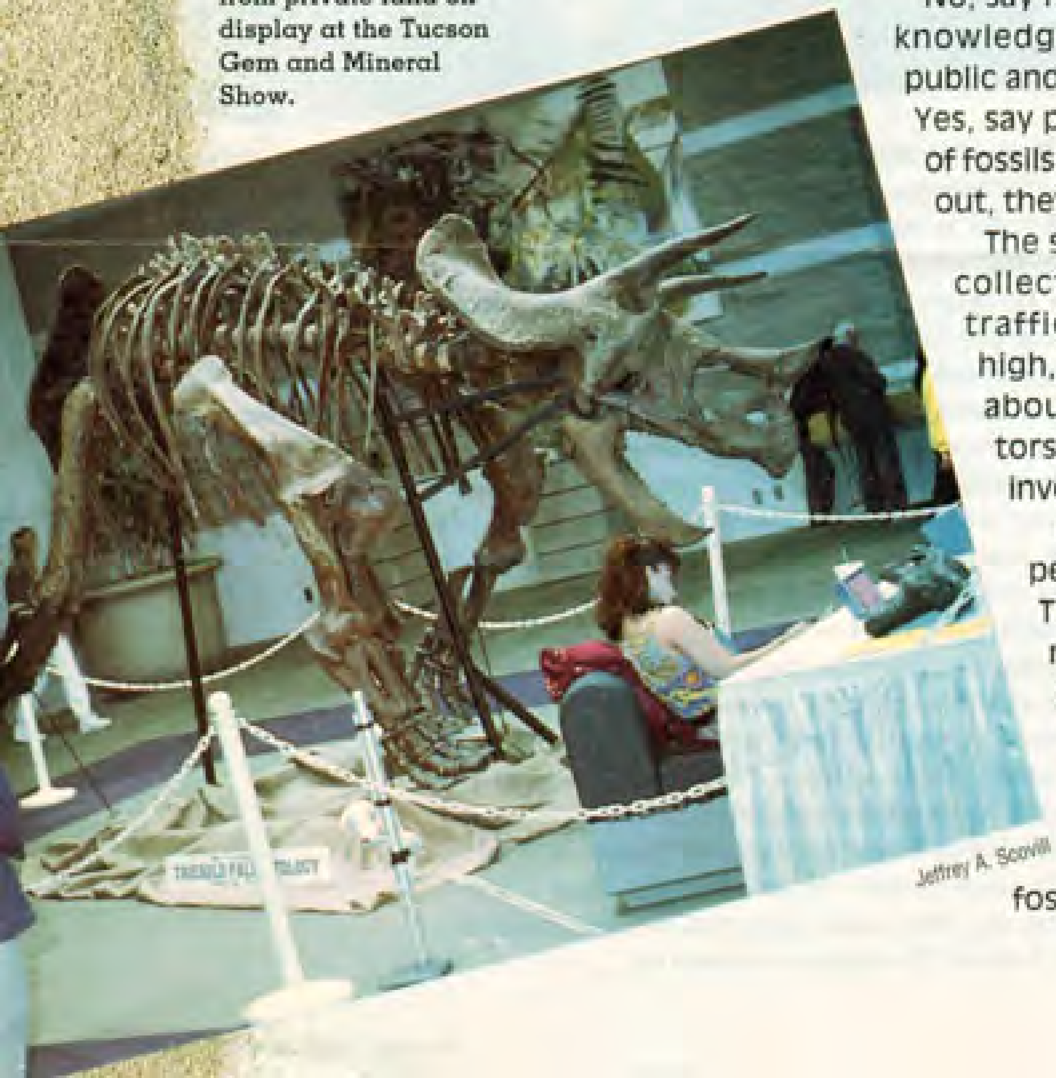
It's an issue that splits the world of fossil hunting down the middle.

Every year, on hundreds of millions of acres of public land in the western United States, the forces of wind and water uncover a fresh crop of fossilized bones. Under federal government regulations, all of those bones, as well as footprints and other remnants of the creatures that bore them, are reserved for scientists. But many fossils are worth a lot of money, too, and business people who buy and sell fossils would like to take a crack at them. Should they get the chance?

No, say many researchers: these fossils, and the knowledge we glean from them, belong to the public and shouldn't disappear into private hands. Yes, say professional collectors: there are plenty of fossils for everyone — and if we don't dig them out, they will erode into nothing.

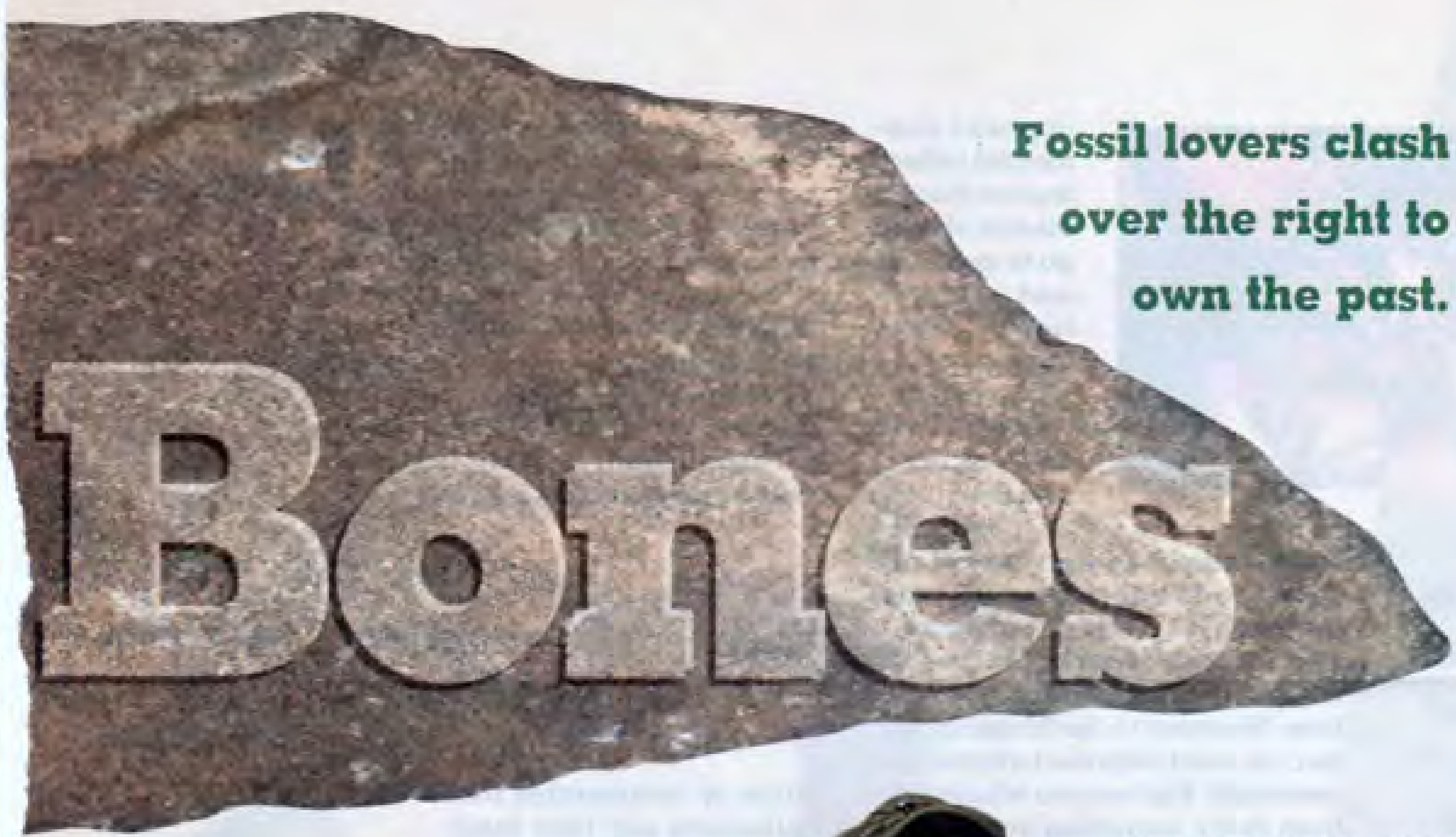
The stakes are high. The FBI even raided one collector and arrested him on suspicion of trafficking in stolen bones. Emotions run high, too, and grievances and horror stories abound — from scientists, amateur collectors, dealers, museum curators, and others involved in the dispute.

Earth has invited a broad range of these people to air their opinions in these pages. They include the head of the major organization of vertebrate paleontologists; a well-known commercial collector; a volunteer field worker; a fossil broker; and a Canadian museum director with a radically different take on fossil regulation. All of them care deeply about fossils. And they think you should, too.



Triceratops skeleton from private land on display at the Tucson Gem and Mineral Show.

Jeffrey A. Scovill



Bones

Fossil lovers clash over the right to own the past.

Don't sell our fossil heritage

EARTH Illustrations: Terri Metzger

Louis L. Jacobs, paleontologist, Southern Methodist University; president, Society of Vertebrate Paleontology

What should become of fossils found on federal public land? Should every effort be made to collect, preserve, study, and display — in effect, to use the fossils for all the people of the United States? Or should federal public lands be opened to commercial collecting — to selling our paleontological heritage?

I think all vertebrate fossils from federal public lands should go to the public good and not be sold off. This view of the public value of fossils is shared by most Americans and put into practice by many private landowners. For example, earlier this year, *Lone Star Dinosaurs*, a museum exhibit I helped develop, was on display in the rotunda of the Texas state capitol in Austin. Texas legislators lauded the exhibit in official speeches. Politicians know that people like dinosaurs, and they know that Texans take pride in seeing this part of the story of their state brought to light for the first time.

Most of the fossils displayed in *Lone Star Dinosaurs* came from private land. The landowners gave their fossils to the public good. Selling fossils from federal public lands does just the opposite — it removes fossils from the public good. And landowners see this. For instance:

As a grandfather, Billy Jones had one desire for the *Pleurocoelus* bones on his land: "I want my grandkids to be able to see these bones in the museum and say, 'These came from my grandpa's place.'"

Seven-year-old Thad Williams was out with his father, a high school biology teacher from Millsap, and found three individuals of a new species of *Tenontosaurus*. The owners of the land where Thad made his find wanted to see these fossils studied and displayed. Now a skeleton is on display in Fort Worth, seen by over a million visitors a year, and the name of Thad's dinosaur is being published in the *Journal of Vertebrate Paleontology*.

These Texans aren't unusual. A recent survey shows that most Americans agree. In 1995, the Dinosaur Society asked three hundred adults what should be done with fossils found in the American West in various hypothetical situations. In most cases, more than three quarters of the respondents

Government policies give special protection to fossils of vertebrates — including fish.

Courtesy University of Wyoming Geological Museum

Courtesy Chris Weege

opposed commercial collecting and thought fossils should go to museums and universities for scientific study.

Private landowners like those of Texas own their place on Earth. But even those of us who are not private landowners possess vast areas of land. We — together — own the federal public lands of the American West, millions of acres from Montana to the Mexican border, in most adjacent states and westward. And we own what comes from them, including some of the most amazing and important fossils in the world.

Public land in the West is controlled by several public agencies, most notably the Bureau of Land Management (BLM), the Forest Service, and the National Park Service. On land managed by the BLM, people may collect invertebrate fossils (that is, fossils of animals without backbones, such as clams and starfish) and small amounts of petrified wood for personal use, but they need a permit to collect vertebrate fossils. Other agencies have more restrictive regulations, but the upshot is that vertebrate fossils cannot be commercially collected and sold from federal public lands.

That is as it should be. Vertebrate fossils of a given species are usually rare. They can also be spectacular — even awe-inspiring — and since private landowners are free to sell fossils from their own lands, a commercial market has developed. Vertebrate fossils are sold at curio shops, at auctions, through catalogs, and on the World Wide Web, sometimes at posted prices of tens of thousands of dollars. Each sale represents educational and scientific value lost from the public domain.

Federal public lands are our legacy and one source of our national pride. As a paleontologist and researcher, I value fossils for what they tell us about how Earth works, about time and place, who was where when. The knowledge gained from studying Earth can and should be put to use to make a better world for people. Education and pleasurable fossil experiences are two of those ways, and both depend heavily on our federal public lands as their source. We, as responsible citizens, should manage for our grandchildren, and all grandchildren, what is rightfully as much theirs as ours.

> "You can go to the Denver or Tucson rock shows and see appalling things. But you can go to museums and see appalling things, too: large museums where fossils disappear, specimens unprepared after fifty or a hundred years, bad preparation. Nobody is so righteous to be able to point a finger at somebody else — to say 'you can't do it.'"

Chris Weege, petroleum engineer and amateur fossil hunter, Littleton, Colorado

We don't want a free-for-all

Mike Triebold
president,
Triebold Paleontology

Critics of commercial fossil collectors say that businesses such as mine should not be allowed on public lands because fossils there must be protected "for the children." Anyone I have ever heard invoking "the children" had a hidden motive, and this case is no exception. Public land is the academics' exclusive domain, and they want to keep it that way.

At present, almost all permits for collecting fossils on public land are held by academic paleontologists affiliated with universities or museums; independent collectors are not invited. The academics' idea of benefit to the public is very narrow: when one of them finds a fossil, it goes to that person's institution. It probably will never be displayed (museums used to brag that fewer than one percent of their fossils were on display). A new or unusual find might be studied and written up in a scientific journal, but whatever its fate, at least it will be saved from being *sold* (oh, the horror!).

The real enemy of fossils, however, is not commercial collecting

"In the past, people would cut corners — and cut barbed wire. *Everybody* has been guilty of violating that one. Now there's pressure for people to clean up their act."

Sally Shelton, paleontologist, San Diego Museum of Natural History

but nature itself. Every year, on ranchland in western Kansas, I find new specimens weathering out of the same rocks. Without a trained eye to find them, they would simply erode away unnoticed. The federal public land in the United States — 470 million acres of it west of the Mississippi — is so vast that all the academic paleontologists in the country, working full time, couldn't cover it effectively. Yet even though they know they can save only a tiny fraction of the eroding fossils, they would rather sacrifice the rest than let any of them be saved by private companies.

What commercial collectors are seeking is not a free-for-all on public lands but an opportunity to collect there responsibly. The more workers there are, at all levels, the more fossils will be saved. The National Academy of Sciences reached the same conclusion in 1987, when a panel studying this issue wrote: "The science of paleontology is best served by unimpeded access to fossils and fossil-bearing rocks in the field."

To show how that could be done, I have proposed what I consider a moderate plan that would benefit everybody. Under my proposal, commercial companies must comply with all the provisions of a permit (completing a paleontology course would be one way for collectors to meet the requirements). In the field, they must collect the same data as any academic paleontologist. Any one-of-a-kind "type specimen" they find automatically goes to a fossil repository, and the collector receives a standard fee. That way, discoverers get a reasonable return for their efforts, while the most scientifically valuable specimens are preserved for the good of all.

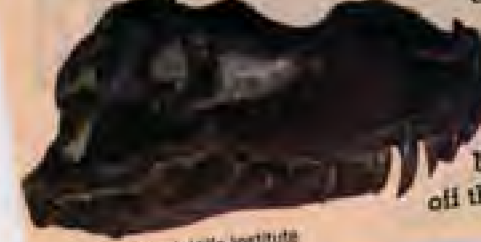
As for other specimens, collectors may dispose of them as they see fit. That's only fair: they have paid their permit fees (to the public) and have taken the risk of possibly finding nothing. Whenever a collector sells a fossil, however, he must pay a royalty to the state for the privilege of collecting — and the more work he puts into cleaning and preparing that fossil, the higher the royalty will be. For example, suppose the royalty is eight percent. If a "raw" fossil specimen in its plaster jacket sells for $500, then the collector must pay $40 in royalties. But the same specimen, properly prepared, might bring $10,000 — and $800 in tax. Since most collectors prepare their finds, the value-added factor of their skills as preparators could bring the public a significant bonus.

Nothing is lost, more is preserved, more fossils are available for display and study, and taxpayers benefit. Everyone wins, and the arguments against commercial fossil collecting on public lands dissolve.

"Science has benefited over and over from the finds of commercial and amateur collectors, and we feel that they should be allowed on public lands. Some of the most prolific fossil strata are on public land, and almost all of the fossils that are exposed get destroyed. Nobody is gaining anything — not science, not the marketplace.

What damage might be done — and certainly there would be some, by somebody who is not knowledgeable or, God help us, somebody who is greedy — is going to be so minute in proportion to what's going on right now. And the net gain to science would be so large that we can't even imagine it."

Marion Zenker, legislative coordinator, American Lands Access Association; administrative assistant and marketing coordinator, Black Hills Institute, Hill City, South Dakota



Pete Larson knew almost at a glance that Sue was the best Tyrannosaurus rex skeleton ever discovered. What he didn't know was that the ranch where she lay had been deeded to the government — and thus was, temporarily, federal land. The mistake cost him dearly. On May 14, 1992, the FBI raided Larson's fossil business, the Black Hills Institute, in Hill City, South Dakota. Agents seized the dinosaur, along with other fossils and business records. Larson was later convicted on charges unrelated to Sue and was sentenced to two years in prison. Sue went to New York to be auctioned off this fall at Sotheby's.

Ed Gerken/Black Hills Institute

How dare someone do this to the fossils!

When someone wants to damage a place you care about, your first impulse is to try to stop him — unless he has a pistol on his hip and a bad attitude.

The place was the Garden Park Fossil Area, a world-class Jurassic fossil site on public land in Colorado. In 1990, I was out with a group surveying the area for fossils. He was doing the same thing for a different reason. I am a "para-paleontologist," an amateur trained to work with professional paleontologists, a qualification I got through two years of study at the Denver Museum of Natural History. He was a commercial fossil collector. Legally, I belonged there; he didn't.

Patricia E. Monaco, paleontological volunteer, Garden Park Fossil Area, Colorado

But the man didn't see it that way. He had as much right to be there as I did, he said. What's more, he could do whatever he wanted because, as he put it, "There is no law."

No law? I hear that a lot from commercial collectors I encounter in the field, though never from the scientists I work with or the agencies that issue our collecting permits. The only reason my gun-toting friend was at Garden Park was that there was no one around to throw him out. With only one ranger patrolling the whole eastern half of Colorado, access to public land has to be based largely on trust. In my experience, scientists have proven themselves trustworthy; commercial collectors have not.

Having worked with professional paleontologists for more than a decade, I know how much painstaking work is involved in prospecting, mapping, excavating, and restoring sites; in preparing fossils; in researching and publishing scientific papers. Not many commercial fossil collectors make that effort, and consequently, valuable scientific information is lost forever. When I am out in the field, it fills me with outrage to see a large gouge in the countryside, made by a backhoe and left open and exposed with plaster and trash strewn around and any remaining "unsaleable" fossils destroyed with hand tools. How dare someone do this to the fossils — and to a landscape that may not recover for centuries?

Fossils cannot be mass-produced like dinner plates or blue jeans; they are finite and limited. To buy or sell them without regard for scientific understanding is something I cannot fathom. What benefit would I get from owning a scientifically valuable fossil? A decoration for my living room? How could I enjoy it, knowing how much the fossil might add to our knowledge of the past? As it happens, I do have a small collection of fossils. They are replicas, given to me by the scientists I work with — mementos of unique or significant finds I have contributed to their research. They give me more satisfaction than owning the "real thing" ever could.

Not long ago, I was out in the field teaching a group of amateurs what they must do before they take a fossil out of the ground. I told them about mapping and gathering information about the locality and its geology. About letting other scientists working this area know about our finds. About the grueling work involved in excavating a fossil. About the ranger who (if he is around) can arrest any of them who breaks the law.

As I was winding up my lecture, we came across a commercial collector who dared me to stop him. All my talk about methods and ethics meant nothing to him. If he felt like it, he could have done what I did: earned a federal permit, and the freedom to collect fossils side by side with scientists, by choosing to work conscientiously

Courtesy Rick Wicker/Denver Museum of Natural History

Students in the Denver Museum of Natural History Certification Program in Paleontology take to the field in western Colorado.

↑ **science** ↑ **$$$ value**

Dinosaur eggs

Collectors clamor for them; scientists study the embryos.

↓ **science** ↑ **$$$ value**

Phareodus encanstus

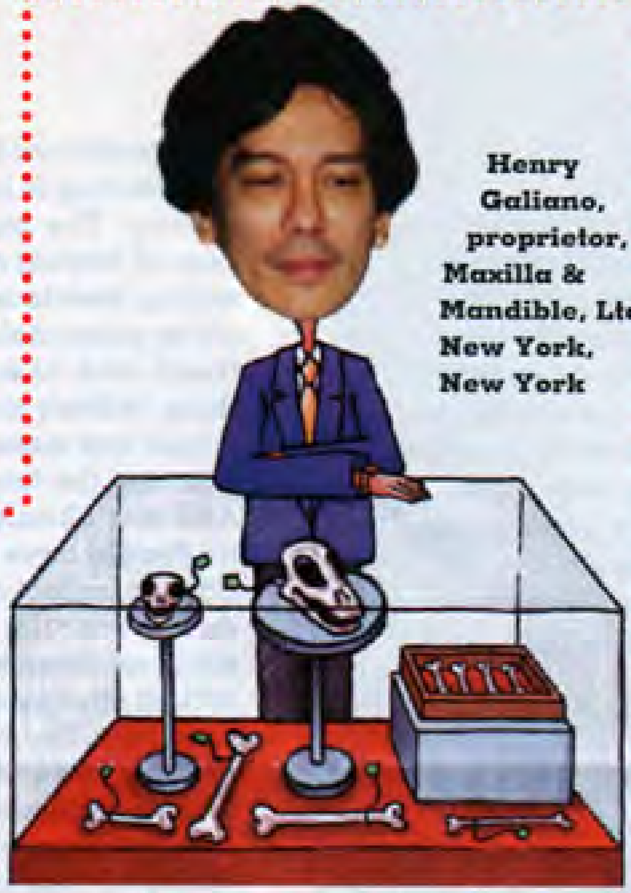
... and many other Wyoming fish. Scientists already have a lot, but they look great on your wall.

Bones of

The hottest fossils always add up

and non-exploitatively within the law. But that's not what he wanted. *He* claimed a different kind of "freedom": the freedom to do whatever he likes on public lands, whenever he likes, with no regard for any laws.

People like him are the reason public land should remain off-limits to commercial fossil collectors.



Henry Galiano, proprietor, Maxilla & Mandible, Ltd., New York, New York

There are dealers, and then there are dealers

Being a commercial fossil dealer with a background in paleontology is like straddling a barbed-wire fence: I have a foot in each camp and a lot of grief in the middle. But it is a privileged position, too, and it has led me to an unusual conclusion. I think a few dealers are professional enough to be allowed onto public lands. But the rest should be kept far away.

Right now, academic paleontologists in North America feel outnumbered. They see themselves as surrounded by barbarian hordes who have more hands and fewer scruples than the scientists do. Unfortunately, some commercial fossil collectors live up to that reputation. Many dealers — even well-equipped, well-intentioned ones — simply don't know what they are doing when they collect in the field. Many of them will collect only part of a skeleton, such as the skull, and leave the rest behind. Or, ignorant of vertebrate anatomy, they will restore fossils inaccurately, ruining specimens with irreversible epoxy glues.

Meanwhile, conscientious commercial collectors feel aggrieved, too. Some of them contribute to scientific research already, or would like to. Yet (as they see it) arrogant paleontologists treat them as second-class citizens. By alienating responsible commercial collectors, paleontologists are cutting themselves off from a valuable source of important specimens. They are also eliminating a big incentive for the bad apples to change their ways: the desire for respect.

Both sides need to change some of their attitudes before they will be ready to share the same turf. Let me start with some words of wisdom for the academics:

"I think commercial paleontologists should be kept off public land. But it's important that we move beyond this controversy. The community of fossil people — academic, museum, amateur, and commercial paleontologists — is small, and we could all use one another's help. Yet we are polarized by mistrust and lack of a common goal.

A few changes in attitudes and behavior would make life easier for everybody. Commercial collectors could gain credibility by acknowledging that certain fossils are too important to be subjected to the whims of the marketplace. By donating important fossils — creatures that might be new species, for instance — found on private land to museums, they can show that they understand the real significance of rare fossils.

At the same time, the professional community should acknowledge that many fossils — including some vertebrates, such as fish from the Green River Formation in western Wyoming — are so common that commerce in them causes no major loss to science."

Kirk Johnson,
paleontologist, Denver Museum of Natural History, Denver, Colorado

▲ **science** ▼ **$$$ value**

Multituberculates

Short on glamour, these extinct near-mammals are long on evolutionary importance.

▼ **science** ▼ **$$$ value**

Shark teeth

Abundant supply, low demand.

Contention

for science don't
to cold cash.

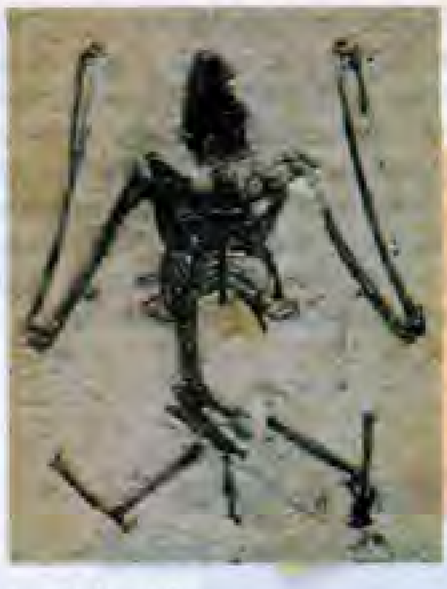
"I've run my own fossil-collecting business for forty-two years. We cooperate with the scientists. Every time we get something that looks halfway decent or possibly new, we've turned it over to them. I think that's true of most commercial fossil collectors.

If you checked with members of the Society of Vertebrate Paleontology, I think you'd find that only a few of them are against commercial collecting. The rest of them see that it's good for science — that if it weren't for commercial collectors, about half the specimens they study would never have got out of the ground. It's just that about half a dozen people who run the SVP are radical.

People forget that all the early dinosaurs in the United States were collected from public lands. If you put back all the ones from public lands, there wouldn't be many of them left on display."

Allen Graffham, president, Geological Enterprise, Ardmore, Oklahoma

What's your opinion about fossil rights and wrongs? Talk back on our Web site: WWW.EARTHMAG.COM Look for "Battle of the Bones."



Rarest of the rare, fossils such as this fifty-million-year-old bat from Wyoming are coveted by scientists and commercial collectors alike.

Courtesy University of Wyoming Geological Museum

Commercial fossil collecting is here to stay. The business of buying and selling fossils is as old as paleontology itself and, if anything, is likely to get bigger and more efficient in the future. And why shouldn't it? People have the right to collect and enjoy fossils as much as those who collect stamps and seashells. The real issue is how to protect scientifically important, rare, and unique specimens.

Most commercial dealers aren't after your fossils. Many paleontologists think commercial collectors make their living from rare, expensive vertebrate fossils. Actually, most of the fossils offered to the public are common ones — amber, ammonites, trilobites, fish, petrified wood, and sharks' teeth — ranging in value from a few dollars to, at most, several hundred dollars. At major trade shows and in retail businesses like mine, virtually all of the fossils sold are nonvertebrate fossils. Why? Because people can afford them.

Vertebrate fossils are not created equal. Not every bone eroding out in the badlands will advance paleontological knowledge. Consider the hundreds of thousands of fossil fish that have been collected from the Green River Formation, a rock unit that stretches across vast areas of Wyoming, Colorado and Utah. The fossils from those localities are well represented in most institutional collections; their scientific value has long since passed the point of near-zero marginal returns. In cases like this, commercial collecting, under professional supervision, poses no threat to paleontology.

Some places do need special protection from unauthorized amateur and commercial collecting. Commercial collectors in Florida have already destroyed sinkhole deposits containing species unique to this part of North America. Another shameful example is the frequent illegal collection of fossil mammals on federal lands in the Bridger Basin of Wyoming. Preserving vulnerable areas, in their entirety, is just as important as protecting scientifically important specimens — and it should be a great deal easier to achieve.

The "other side" values your approval. Most commercial collectors share a deep devotion to fossils, and the professionals among them dislike the rascals as much as you do. I think recognition from professional paleontologists would go a long way toward bridging the gap between the two camps. Maybe what we need is a program aimed at teaching commercial dealers what to do and how to do it. The Society of Vertebrate Paleontology might offer classes as a requirement before applying for some kind of collecting permit on federal lands.

Perhaps someday paleontologists and fossil dealers will coexist the way archaeologists and art dealers do now. Art dealers, like fossil dealers, see the aesthetic beauty and value in the objects they sell, and archaeologists occasionally tap them for information about artifacts and localities. If similar links could be forged in the fossil community, both sides would flourish.

Before that can happen, though, commercial collectors must become better educated and must do their own part to establish constructive, mutually beneficial relationships with paleontologists. Only then will they be ready for prime time — and for prime collecting spots on public lands.

For Canada, regulation works

Bruce Naylor, director, Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta, Canada

This furor over fossil collecting is old news to those of us in Alberta, Canada. We went through a similar debate in the 1970s, when the government was preparing to pass our Historical Resources Act, which restricts fossil collecting much more severely than anyone has proposed to do in the United States. But pass it did, and for two decades Albertans have been living the reality of what some in the United States fear and for which others hope. For us, I believe, regulation works. But I didn't always think so.

Before the act became law, Albertans were free to collect fossils as long as they were outside provincial parks. After passage, at one stroke, all fossils on public *and private* land became public property. They belong to us all. A few types of fossils — oyster shells, fossil wood, and the remains of ancient marine mollusks known as ammonites — may be collected and sold commercially under permit. Vertebrate fossils, however, may be excavated only by qualified scientists operating under a permit, and they must be cared for in a public collection run by a museum, university, or government agency. If fossils are found on the ground, rather than in it, children and amateurs may keep them. Even these surface-collected fossils remain public property, however, and any of them collected since 1978 may not be sold or removed from the province.

While debate over this law was still roiling, some people feared that it would shut down all collection of fossils. I too was appalled at the idea. I was a graduate student at the University of Alberta at the time, and I saw it as a government intrusion that might limit my access to fossils that I needed for my research. How dare the hand of the state mess with my profession?

Today I find myself helping to administer the very law that worried me so much. I'm both the director of a public museum and the Provincial Palaeontologist, and our museum processes applications to excavate fossil resources.

Frankly, I believe that the overall impact of the law has been very good. Scientists and museums have been able to continue to collect freely, under permits reviewed by a panel of our peers. Unique specimens — collected by professionals and properly studied and protected — are available for study and enjoyment by Albertans and non-Albertans alike. Commercial collectors were affected, of course, but most of them shifted their interests to non-vertebrate fossils. Others moved their collecting south of the border.

I believe strongly that there is a role for commercial and amateur collectors but that it is the proper role for government to regulate these activities. For my province, Alberta, the loss of unique specimens to private collections is, in my opinion, wrong, and government has both the right and the responsibility to limit this loss to science and to future generations.

Would I recommend similar laws for the United States? Not necessarily. We have different histories and different fossils to protect. National and regional characteristics must be taken into account, as well. One of our countries became a nation during a revolution, giving its citizens "life, liberty, and the pursuit of happiness"; the other evolved from a colony, providing its citizens with "peace, order, and good government." I can't say which is the proper route, but I can say that for Alberta, if there had been serious problems with the law, we would have changed it. ⊕

In 1991, firespotters in northern Wyoming noticed commercial fossil collectors unearthing the near-perfect skeleton of an adolescent *Allosaurus* on federal land. Paleontologists finished digging up the dinosaur. Today casts of "Big Al" are on display in two museums, and scientists are studying his bones. During his short life, Al racked up more than a dozen bone injuries. He lived fast and died young. But he didn't escape the feds.

Courtesy University of Wyoming Geological Museum