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# NEW MEXICO QUARTERLY

## STORIES

JESSE STUART

BERNARD EPPS    ELROY BODE

LOUISE CRAGO

## THE GOLDEN BOUGH AS LITERATURE

STANLEY EDGAR HYMAN

## THE CARIBE-CUNAS & THEIR JUNGLE MAGIC

MARGARET INMAN MEADERS

## VERSE

WINFIELD TOWNLEY SCOTT

FRANKLIN DICKEY

VINCENT BARRETT PRICE

ALFRED EBELT    CARL CAREY

## BOOK REVIEWS

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SEVENTY-FIVE PAGE SUPPLEMENT

## NEW MEXICO'S FOSSIL RECORD

STUART A. NORTHROP

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DOUBLE ISSUE

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## DOUBLE ISSUE

containing

### NEW MEXICO'S FOSSIL RECORD

BY STUART A. NORTHROP

AS A SPECIAL SUPPLEMENT

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## HEADNOTES

THIS double number of the *Quarterly* carries a pamphlet-length feature, "New Mexico's Fossil Record," by DR. STUART A. NORTROP of the UNM Geology Department. For years it has been the custom of *NMQ* to reprint the Annual University of New Mexico Research Lecture, of which this is the Eighth. In the next issue, DR. T. M. PEARCE of the Department of English, presents the Ninth in this distinguished series, "The Lure of Names," from his years of study in New Mexico place names.

It is hard to say whether Kentucky writer JESSE STUART is better known for fiction or for verse—examples of both have appeared during two decades in the *Quarterly*. In 1961 he received the \$5,000 award of the Academy of American Poets for "distinguished service to poetry." From Everyman's edition of *Man With the Bull Tongue Plow* to 1962's prize-winning *Hold April*, he has been valued as a poet, but his homely hill stories such as the best-selling novel, *Taps for Private Tussie*, have contributed much to his popularity.

WINFIELD TOWNLEY SCOTT, the noted American poet, has favored the *Quarterly* in the past with both prose and verse. He received the honorary Litt.D. from the University of New Mexico in 1962, an honor he had also received from Rhode Island College. His *Collected Poems* have

been published recently by Macmillan. Originally a New Englander, Mr. Scott lives in Santa Fe. He was for twenty years on the staff of the *Providence Journal*, the last ten as literary editor. He has also been a Phi Beta Kappa poet at Brown University, where, as an undergraduate, he was member of the society, at Tufts College, and at Harvard. His recorded poems in the Yale series were reviewed in a recent *Quarterly*; his collected essays, *Exiles and Fabrications*, are reviewed in this issue.

A Ford Foundation fellow currently pursuing his studies in anthropology at the graduate school of University of New Mexico, V. BARRETT PRICE is a graduate of the University. He has traveled in Western Europe and has spent a semester at Universidad de Mexico. This issue marks his debut in creative writing.

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*Jesse Stuart*

## NEARLY TICKLED TO DEATH

My father threw his bean basket and took off running across the field like a wild turkey. He was slapping the side of his face with his straw hat as he went over two bean rows every time he leaped.

"Did you get in a yellow jacket's nest, Pa?" I shouted.

"Not like a yellow jacket's sting," he yelled back. "It's worsel!"

On the far side of the bean patch was a high bank. He was going so fast toward this forty foot dropoff I thought he was going over. He had to stop so suddenly and brace himself he tore up two bean rows. He was still slapping the side of his face with his straw hat.

"What is it, Pa?" I screamed.

He was now running down the field between two rows. "Pa, can I help you?"

He didn't answer but kept on running, hitting his face with his hat. Every half dozen steps he let out a wild scream.

"Pa," I shouted. "Pa!"

Pa's not a big man. Not much bigger than I am. He's 40 years old and I'm 14. I didn't know a man as small and as old as my father could stretch his legs so far and run so fast. I went after him. The way he was screaming, hollering and running scared me half to death.

It took something to make him run. I'd seen a man try to bluff him once over a line fence. He came at Pa with a double-bitted ax and I ran that time. Pa picked up a rock and stopped him. Pa wasn't afraid of fighting bulls, biting dogs, yellow jackets, hornets or any man. Once I saw him pick a copperhead up by the tail and wrap it around a tree. That finished the snake that struck at me but missed. He was small but he'd stand his ground. I'd never seen him run from anything before.

Now, he was circling the two-acre bean patch and I was trying to catch him.

"Pa——"

"Don't talk to me," he shouted. "I don't know what it is. It's something powerfull! It's tickling me to death!"

He circled the bean patch twice with me cutting corners trying to catch him. He was fighting something I couldn't see and screaming like a laughing hoot owl. I tried to get close enough to see what was after him. I tried to head him off but I couldn't.

The bean patch wasn't a big enough place to hold him. He took off down the lane toward the house. I lost more ground trying to keep up with him on this straight road. His legs were stretched out until he looked like he was running on the wind. I was doing my best to keep in sight. He didn't stop to open the barnlot gate. He went over it like a young mule.

When I opened the gate he was nearly almost to our yard. I guess Mom must have seen him through the window for she ran out on the porch. She jumped from the porch and came running to meet him. Mom had never seen him run like this either.

"Bud, Bud, what's the matter?" she screamed.

Dave Royster, a meddlesome neighbor who lives in sight, dropped his hoe in his garden when he saw Pa running. He took off running across the little meadow between our houses.

"What is it, Bud?" Mom screamed with her hands high in the air.

"You tell me what it is, Faye," he shouted.

"I can't see anything," she said in a high voice.

"I've never seen anything either," he shouted, and kept on running. "But it's there!"

He sidetracked Mom and started around the house.

"Acts like a dog with a running fit," Dave said, running up. "I've never seen a man run like that before. I've seen dogs!"

Pa was coming around the house now and Dave tried to head him off. Dave made an awkward grab for his arm but missed it as Pa ran between us. I thought about a shoestring tackle.

I'd made third-string football team in Maxwell High School, but Pa was lifting his feet so high he'd have got me with one of his brogan shoes.

"Just have to let him run down," Dave said. "He's wound up like an eightday clock! I've never seen a man run like him before!"

"No, we won't let him run down like a clock either," Mom panted as she came around the house after him. "There's something after Bud! Help me catch him!"

"You go around after him, Faye, and I'll go this way and meet him when he comes around," Dave said with a trembling voice. "Maybe I can hold him! He might be off in the head!"

## NEARLY TICKLED TO DEATH

7

"He's not off in the head," I said. "Something is tickling him to death!"

"Tickling him," Dave said. "Then why doesn't he laugh?"

Dave went around the house the way Pa was coming and was close behind. When Pa came around the corner he hit Dave headon and Dave hit the ground. I dove for a shoestring tackle but the legs I tried to grab just wasn't there. I scooted ten feet on my stomach over the grass. My head was within two inches of the wall when I got up slowly.

"He knocked the breath out of me," Dave said getting up slowly. "He's crazy!"

"He's not crazy," Mom said, getting her breath fast. "There's something after Bud!"

"I'd like to know what it is," Dave said.

"I'll get him next time," I told Dave.

I figured Pa would be slowing down and I could tackle him.

"Don't let Bud run into Faye," Dave warned me. "He's a wild man!"

"Tickling me to death," Pa panted as he turned the corner full-speed toward us.

"Watch out, Mom," I shouted.

I didn't have to tell Dave. He got out of the way. I dove at Pa's feet and I caught his ankle with my hand. I couldn't hold on but he went end over end. His straw hat rolled like a barrel-hoop.

"Get hold of him, Dave," I said. "Help me hold him! Let's see what's after him!"

"Are you hurt, Bud?" Mom said, running up.

Dave was down beside him now.

"I don't see a thing," Mom said.

"But it's something," Pa moaned.

"It's a running fit," Dave said.

Mom and Dave were both looking at the side of his face.

"It's there, he said, slapping his face with his hand. "It's after me!"

"Bud, I don't see a thing!" Mom said.

Pa was on the ground doing all kinds of didoes.

"Must be in your ear," Mom said.

"That's exactly the way my hounds acted when they had running fits," Dave sighed as he watched Pa who was rolling like a dog toward the house. "My hounds acted like they had something in their ears. A racehorse couldn't have kept in sight of one."

"I never heard of a man having a running fit, Dave," Mom said disgusted like. She followed after Pa when he rolled against the house.

"What on earth is wrong, Bud?"

"Don't ask me again, Faye," he spoke like a laughing owl. "It's tickling me to death."

"Stay still long enough until I can look in your ear," Mom told him.

"Quiet, now Bud! Quiet!"

He shook his head there on the grassy ground but Mom held his head and looked in his ear.

"I don't see a thing," she said. "Let me send Bill after a doctor!"

"Oh, no," he said. "Maybe it will stop tickling me. That tickling has eased up some now!"

"Exactly like a running fit," Dave said. "The spell eases on one of my hounds after he runs until his tongue almost touches the ground!"

"Dave, that's crazy talk," Mom said. "Don't go away from here and tell Bud had a running fit!"

"He's had something, Faye," Dave said. "I never seen him act like this!"

"Well, I've never either," Mom said. "I know something is after Bud!"

"Sometimes it's just in the mind," Dave grunted.

"It's not my imagination," Pa said. "This trouble is real!"

"Did you see anything, Pa?"

"Not a thing," he told me. "I just felt it. Now, let me stay right here and not move. It's stopped tickling me."

We stood over Pa, looking down at him. His face was red and sweaty.

"You hollered, Bud, just like a dog with a running fit," Dave told him.

"Stop talking about Bud's having a running fit," Mom told Dave.

"It's something in his ear. I'm going to look again!"

"Don't you stir it up again," Pa said. "Let me lay right here and rest while it's not tickling."

"I thought I saw something move in there," she said. "Honest I did! Looked like a little gray ball!"

"Well, it might be," Pa said. "But I don't feel it now."

Pa lay there on the cool green grass looking up at us. He got his wind back then he got up on his feet.

"Still some tickle there," he said putting his hand on his ear. "But I feel much better now."

"Maybe whatever it is got tired too," Dave said. "Maybe that little white ball is resting to get a fresh start. I've seen one of my hounds rest from one running fit and then go right into another one."

"You're not helping Bud any to talk that way," Mom said. "Maybe

you'd better go back to your garden!"

"No, I'm hanging around to see if Bud takes off again," he said. "You need me here, Faye! This thing isn't over yet!"

"Bud, if that's something in your ear, I'll fix it," Mom said.

"How, Faye?"

"Kill it with heat!"

"Leave me be now, Honey," he told Mom. "Don't bother it as long as it's just tickling a little. I can't stand to be tickled to death!"

"But, I'll heat the smoothing iron," she said. "I'll put a cloth around it so it won't burn your ear! I'll fix whatever it is!"

We went into the kitchen and Mom plugged the cord in and turned the juice on like she was going to press my pants.

"I think steam would do it better," Dave said. "It's soft and can get up in the little ear hole."

"We'll try the smoothing iron first," she said.

Mom had her own way. She wrapped the iron with a cloth. She had Pa to lie down on the divan and she put the smoothing iron to his ear.

"That heat's stirring that little white ball up," Pa said. "Maybe it's trying to get out!"

Then Pa threw the iron off on the floor. He jumped up and started running wild over the living room. He kicked over chairs and leaped the divan.

"I told you steam would be better," Dave said. "Let's catch him, Bill! Faye, put water in the teakettle and turn the stove up high!"

Mom ran to heat the water while I dove for Pa's legs. I liked tackling in football. This time I made a perfect shoestring tackle and brought Pa down before he broke up every stick of furniture in the living room.

"I told you how my hound rested before he took off on another running fit," Dave said.

"Hold his body down, Dave," I told him. "I've got his legs."

His legs were hard to hold. He was taking on again something awful.

"While the water heats why not use the flit gun, Faye," Dave said.

"A little flit in Bud's ear won't hurt him."

"Beesmoker would be better," I said. "The beesmoker will push the smoke up in his ear."

Mom came with the flit gun. She pumped it into Pa's ear.

"That thing's trying to dig deeper," Pa shouted. "I feel it. It won't work, Faye. Don't drive it deeper! It has to come out!"

"I'll try the steam," Mom said. "The teakettle is singing now."

Then, she came with the teakettle while we held Pa who was kicking

something awful. She put the spout up close to Pa's ear. Steam shooting out of the spout shot up into his ear.

"It's hot," he shouted. "It's making that little white ball go deeper! It's tickling!"

"The beesmoker," I said. "That rag smoke blown in there will kill it."

"What do you say, Bud?" Mom asked.

"Anything to stop this thing," he said. "Rag smoke will addle a bee. I don't know what it will do to that little white thing!"

"Pa, if you'll lay still I'll get the beesmoker," I said. "I can have it in a jiffy."

"I'll try," he promised me.

I went after the beesmoker. It was in the smokehouse, loaded and ready to use when we robbed our bees. I fired the rags. I ran in and put the smoker to Pa's ear.

"Smoke is getting in there all right," he said. "It's not hot like that steam but that thing is digging deeper."

"Must be as big as the ear hole is wide," Dave said. "It's closed up the place so smoke can't get to its nostrils!"

"I'm worried," Mom said. "What can we do now?"

"Leave Bud alone," Dave said. "You stirred that thing up once, Faye! Don't stir it again!"

"Leave it alone and let it tickle me to death?" Pa moaned. "No, it has to come out. It feels as big as a bird egg in there! Only it's alive and kicking!"

"It has to be pulled out Mom," I said. "We're pushing it deeper!"

"That makes sense, Bill," Pa said.

"We've got to get a doctor," Mom said.

"While you're getting one here I'll be tickled to death," Pa sighed.

"Maybe it does have to come down," Dave said.

"But how," Mom said. "We don't have anything that will pull it out!"

"Yes, we do, Mom," I shouted. "That new floor sweeper! It's got a little tube that sucks up dust. That will fit over Pa's ear!"

"Oh, yes," she said pleased. "That sweeper Bud fussed so much about me buying from a salesman!"

Mom ran to hook up the sweeper. Pa was about to wrestle Dave under until I grapped his legs again.

"Hurry, Faye," he said.

It was awful the way my little father kicked and carried on. I didn't

know he was so strong. I wondered now if he had gone off in the head but he still talked sensible. And I wondered if he had what made a dog have a running fit. I wondered if it was catching and he'd got it from one of Dave's hounds. I was glad when Mom plugged the sweeper in and pushed it over where we held Pa down on the floor. This ended my wild thoughts. In a jiffy she had the tube hooked on and had the sweeper buzzing like a bee-swarm.

"Do you reckon it will hurt your ear, Bud?" she asked Pa.

"It can't hurt it any worse than it's tickling me now," he said. "Put it on!"

Mom put the little tube over his ear.

"It's trying to hold on," Pa said. "It's digging and scratching! Keep it on! He's losing his toe holds. I felt it turn loose! It's gone! Faye, Glory, Glory, I'm a new man!"

A big smile came over Pa's face. Mom took the tube from his ear and he jumped up from the floor.

"I want to see what it was," Pa said.

Mom opened the end of the sweeper and removed the dustbag. She gave it to Pa.

"It's sealed," she said. "You'll have to tear it open!"

"Good, for it can't get out," he said.

He tore the bag open. We looked into the dust.

"There it is," Pa said. "See it moving in the dust!"

Pa reached down and got it between his thumb and finger. He blew the dust from over it.

"It's one of them hardbacked, gray bean beetles that lays the eggs!" he said.

"You were at the right place to get one down there in the bean patch," Dave said. "Maybe that one was trying to find someplace to lay her eggs!"

"She'll never lay anymore," Pa said, crushing the bug between his fingers and thumb. "That little white thing will never tickle me again."

"I'm glad it's over," Mom said.

"I'm glad I thought of that sweeper," I said.

"I'll get my wife a sweeper, now," Dave said. "She's been wanting one. And when one of my hounds has a running fit, I'll know what to do."



Stanley Edgar Hyman

## THE GOLDEN BOUGH AS LITERATURE

When he assembled the third edition of *The Golden Bough* in the years before 1915, Frazer presented the book as a work of literature. With characteristic ambivalence, he denies that this means giving up its scientific pretensions. Frazer writes in the preface:

By discarding the austere form, without, I hope, sacrificing the solid substance, of a scientific treatise, I thought to cast my materials into a more artistic mould and so perhaps to attract readers, who might have been repelled by a more strictly logical and systematic arrangement of the facts.

More and more, Frazer began referring to his theories as playful fancies rather than as scientific conjectures, writing typically: "I put forward the hypothesis for no more than a web of conjectures woven from the gossamer threads of popular superstition." Brailsford saw this as primarily a matter of artistry, writing:

With a plodding industry that no Teutonic scholar ever surpassed, he managed to combine an artist's sense of form, and even when it grew into twelve big volumes, packed with innumerable notes, *The Golden Bough* moved from the intriguing question of its opening pages to the triumphant solution in its last book with a sureness and grace that resembled rather a musical composition in strict sonata form than a scientific treatise.

Others, like Ridgeway, saw it as primarily the renunciation of the views with which Frazer had been identified. Marett writes in his 1927 Frazer lecture:

Surely, of all the great pioneers of anthropology, Sir James Frazer has been the foremost in proclaiming the purely provisional character of his working principles. Not to speak of that drastic reconstruction of the

theoretical framework which caused the second edition of *The Golden Bough* when it replaced the first to read almost like a different work, I know nothing in the history of science more dramatic, and at the same time more indicative of the true spirit of research, than the *peripeteia* that awaits one in the third edition.

Frazer's *peripeteia* came when he decided that gods were not the embodiment of fertility rites but deified real men. As a consequence he decided to stop taking any theory seriously and to renounce the idea that these phenomena were ultimately explicable, at least by him. Frazer went back to being a literary man. It is interesting to contrast this with Freud's similar experience when he realized that his patients' stories of seduction by their fathers were not experiences but wishful fantasies. Freud remodeled his science as a science of the wishful fantasy, and went on with his work. But Frazer had already changed his mind so many times before. It seemed better to adopt an attitude of playfulness toward all theories.

Precisely what sort of literary form the book has gets as many different replies as the earlier question about what sort of social science it is. Frazer's first insistence is that he is writing an epic of humanity's ascent to rationality and perfection, a *Paradise First-Gained* rather than *Regained*. In the preface to the second edition, he speaks of "enabling us to follow the long march, the slow and toilsome ascent, of humanity from savagery to civilization." The assumption of unlimited perfectibility is never dealt with explicitly in *The Golden Bough*, but Frazer faced it later as the central theme of his two essays on the Marquis of Condorcet. In "Condorcet on Human Progress," in 1922, Frazer wrote: "He was among the first, perhaps the very first, to proclaim as a doctrine, and almost as a dogma, the endless perfectibility of human nature." Frazer adds: "He regarded perfectibility as a general law of nature applicable alike to all organic beings, whether animal or vegetable." In "Condorcet on the Progress of the Human Mind," in 1933, this was restated as: "The course which humanity may be expected to follow hereafter in its progress towards that goal of absolute perfection which it will continually approach without ever actually reaching."

What Frazer does face in *The Golden Bough* is man's limitations as a rational animal, that is, the problem he calls "superstition." "Even in Europe many people still believe," is his characteristic introduction to a superstition, and "So indestructible are the crude fancies of our savage forefathers" is his characteristic conclusion. Frazer's tone is generally

mocking and sarcastic, with such comments as "So hard is it for the straining wings of fancy to outstrip the folly of mankind." Here is his typical irony:

It would be superfluous to point out in detail how admirably these measures are calculated to arrest the ravages of disease; but for the sake of those, if there are any, to whom the medicinal effect of crawling through a hole on hands and knees is not at once apparent, I shall merely say that the procedure in question is one of the most powerful specifics which the wit of man has devised for maladies of all sorts.

Frazer finished the third edition of *The Golden Bough* on the eve of the first World War, and some of his disquiet about man as a rational animal apparently came from those gathering tensions. Bishop writes:

Sir James Frazer, writing before the war of 1914-1918, was aware as were few living men of the primitive substructure of modern civilization. But what was frightening in the aftermath of the war was not that the conflict shattering the walls had revealed old and almost forgotten foundations; it was that an advancing civilization should so terribly emulate savagery. It was society in its most modern form that had insisted on returning to that democracy in arms of savage tribes. It was the advance in technics that had made troglodytes of armies. If we were dying, it was not from our vices but from an excess of our virtues. If there was a revolt from reason, it was not against reasoning as an instrument of living, but against the rationalism of the eighteenth century which, after being transformed into the materialism of the nineteenth century, had in our own become dynamism. A faith in progress had become a most unreasonable faith in motion for its own sake. And its works were not good.

Unnerved about his paradise in the present and unsure of it in the future, Frazer violently wrenches it out of time and history entirely, to produce a Platonic idea or ideal of culture. Epic is not history, Frazer had reminded us in *Passages of the Bible*. In this Platonic view, culture-contact does not result in a changing shape for the culture, but in the destruction of the record. In a key metaphor, Frazer writes:

We are like heirs to a fortune which has been handed down for so many ages that the memory of those who built it up is lost, and its possessors

for the time being regard it as having been an original and unalterable possession of their race since the beginning of the world.

The title-deed is almost indecipherable, an evolutionary palimpsest, but the epic Frazer records is the quest for that grail of culture, and we inherit both the fortune and the traditions about it. Like all mythic quests, this involves a timeless essentializing out of history. Frazer's primary evolution of human thought in *The Golden Bough*, "from magic through religion to science," is not a development in history, but a temporalizing of essence. As far back as the reviews of the second edition of *The Golden Bough* in *Folk-Lore* in 1901, F. B. Jevons wrote: "That magic is distinct from religion, I hold with Dr. Frazer. But that magic is prior to religion, Dr. Frazer produces no evidence to show." Forty years later, with Frazer dead, Malinowski found himself repeating the same basic truth:

In all this we find that evolution, as a metamorphosis of one type of belief or activity into an entirely different one, is not acceptable. We have to assume here, as in many other evolutionary problems, the existence of all the fundamental principles of human thought, belief, custom, and organization from the very beginnings of culture. Magic, religion, and science must be examined as active forces in human society, in organized cult and behavior, and in human psychology. In this we follow Frazer when he affirms that the simple truths derived from observation of nature have always been known to man.

Frazer knew realistically, as Malinowski says, that primitive tribes did not evolve from one to the other, but the essence of these modes was that of a graded series, and their Platonic ideas so evolved. Man, not any men, had progressed from magic through religion to science, and *The Golden Bough* is the epic of that idealized ascent as *The Aeneid* is the similar epic idealization of the rise of Rome.

When Frazer actually came to describe the ascent, he sometimes saw the tragic features more sharply than the hopeful. He writes:

We may feel some natural regret at the disappearance of quaint customs and picturesque ceremonies, which have preserved to an age often deemed dull and prosaic something of the flavour and freshness of the olden time, some breath of the springtime of the world; yet our regret will be lessened when we remember that these pretty pageants, these

now innocent diversions, had their origin in ignorance and superstition; that if they are a record of human endeavor, they are also a monument of fruitless ingenuity, of wasted labour, and of blighted hopes and that for all their gay trappings—their flowers, their ribbons, and their music—they partake far more of tragedy than of farce.

In the preface to the last part, *Balder the Beautiful*, Frazer writes of “the long tragedy of human folly and suffering which has unrolled itself before the readers of these volumes, and on which the curtain is now about to fall.” He concludes the preface more hopefully, promising in future books “fresh subjects of laughter and tears drawn from the comedy and the tragedy of man’s endless quest after happiness and truth.” By 1937, when he published *Aftermath: A Supplement to The Golden Bough*, Frazer was back to identifying the whole work as “a dark, a tragic chronicle of human error and folly, of fruitless endeavour, wasted time, and blighted hopes.”

The imaginative design of the work is built around several key metaphors for the ascent to rationality and its dangers. The most dramatic of these is one that runs through Frazer’s earlier writing, the volcano underfoot. In *The Golden Bough* we see its fullest development:

It is not our business here to consider what bearing the permanent existence of such a solid layer of savagery beneath the surface of society, and unaffected by the superficial changes of religion and culture, has upon the future of humanity. The dispassionate observer, whose studies have led him to plumb its depths, can hardly regard it otherwise than as a standing menace to civilization. We seem to move on a thin crust which may at any moment be rent by the subterranean forces slumbering below. From time to time a hollow murmur underground or a sudden spirit of flame into the air tells of what is going on beneath our feet.

By the preface to *Balder the Beautiful*, this metaphor has modified into a vision of man himself deceptively masked. Frazer writes:

The truth seems to be that to this day the peasant remains a pagan and savage at heart; his civilization is merely a thin veneer which the hard knocks of life soon abrade, exposing a solid core of paganism and savagery beneath. The danger created by a bottomless layer of ignorance and superstition under the crust of civilised society. . . .

"He knew, as he often said," Brailford wrote of Frazer in 1941, conscious of Hitler and the war, "that the primitive savage whose thinking he traced in our still surviving superstitions is alive in the dark places of our hearts." Frazer's common image for culture is of a great fabric. He writes of having touched only the fringe, having "fingered only a few of the countless threads that compose the mighty web." In this fabric, if magic is the darkness of ignorance, religion is the crimson stain of blood. In the penultimate paragraph of the book, obviously influenced by Darwin's great tree, Frazer extends the fabric metaphor:

Without dipping so far into the future, we may illustrate the course which thought has hitherto run by likening it to a web woven of three different threads—the black thread of magic, the red thread of religion, and the white thread of science, if under science we may include those simple truths, drawn from observation of nature, of which men in all ages have possessed a store. Could we then survey the web of thought from the beginning, we should probably perceive it to be at first a chequer of black and white, a patchwork of true and false notions, hardly tinged as yet by the red thread of religion. But carry your eye further along the fabric and you will remark that, while the black and white chequer still runs through it, there rests on the middle portion of the web, where religion has entered most deeply into its texture, a dark crimson stain, which shades off insensibly into a lighter tint as the white thread of science is woven more and more into the tissue. To a web thus chequered and stained, thus shot with threads of diverse hues, but gradually changing colour the farther it is unrolled, the state of modern thought, with all its divergent aims and conflicting tendencies, may be compared. Will the great movement which for centuries has been slowly altering the complexion of thought be continued in the near future? or will a reaction set in which may arrest progress and even undo much that has been done? To keep up our parable, what will be the colour of the web which the Fates are now weaving on the humming loom of time? will it be white or red? We cannot tell. A faint glimmering light illumines the backward portion of the web. Clouds and thick darkness hide the other end.

As the last sentences make clear, a Manichaeian conflict between light and dark pervades the book. The dark ages were literally so, "a dark cloud" over "the intellectual horizon of Europe." Before us is a "yawn-

ing chasm," or a prospect seen fitfully "whenever the mist rises and unfolds the far horizon." Frazer writes:

The domain of primitive superstition, in spite of the encroachments of science, is indeed still to a great extent a trackless wilderness, a tangled maze, in the gloomy recesses of which the forlorn explorer may wander for ever without a light and without a clue.

Of the primitive thinker:

In attempting to track his devious thought through the jungle of crass ignorance and blind fear, we must always remember that we are treading enchanted ground, and must beware of taking for solid realities the cloudy shapes that cross our path or hover and gibber at us through the gloom.

At other times Frazer writes of plunging "into the labyrinth of magic." If ignorance, magic and superstition are dark, gloomy, misted over trackless jungle, and tangled maze or labyrinth, so science, truth and rationality are light, clearings or pathways, clues. Sometimes the book combines imagery of a path with that of light. Here it is not very hopeful:

It is unlikely that the student's search-light will ever pierce the mists that hang over these remote ages. All that we can do is to follow the lines of evidence backward as far as they can be traced, till, after growing fainter and fainter, they are lost altogether in the darkness.

Many of Frazer's reservations throughout the book show this dual imagery. He writes:

However, I am fully sensible of the slipperiness and uncertainty of the ground I am treading, and it is with great diffidence that I submit these speculations to the judgment of my readers. The subject of ancient mythology is involved in dense mists which it is not always possible to penetrate and illumine even with the lamp of the Comparative Method.

Sometimes there is no path, but light itself makes a clearing in the jungle, or does not. "Drawing together the scattered rays of light,"

Frazer writes, he proposes "to turn them on the dark figure of the priest of Nemi." Elsewhere he writes:

The circle of human knowledge, illuminated by the pale cold light of reason, is so infinitesimally small, the dark regions of human ignorance which lie beyond that luminous ring are so immeasurably vast, that imagination is fain to step up to the border line and send the warm richly coloured beams of her fairy lantern streaming out into the darkness; and so, peering into the gloom, she is apt to mistake the shadowy reflections of her own figure for real beings moving in the abyss.

Frazer speaks of Demeter and Persephone, "one of the few myths in which the sunshine and clarity of the Greek genius are crossed by the shadow and mystery of death." Great ideas radiate from great minds "like shafts of light from high towers." "In every age," Frazer writes, "cities have been the centres and as it were the lighthouses from which ideas radiate into the surrounding darkness, kindled by the friction of mind with mind in the crowded haunts of men; and it is natural that at these beacons of intellectual light all should partake in some measure of the general illumination." At other times there is no light, and the image is only of a clearing or path. Frazer writes:

To recur to a metaphor which I have already made use of, we of this age are only pioneers hewing lanes and clearings in the forest where others will hereafter sow and reap.

He begins the book's last chapter:

We are at the end of our enquiry, but as often happens in the search after truth, if we have answered one question, we have raised many more; if we have followed one track home, we have had to pass by others that opened off it and led, or seemed to lead, to far other goals than the sacred grove at Nemi. Some of these paths we have followed a little way; others, if fortune should be kind, the writer and the reader may one day pursue together. For the present we have journeyed far enough together, and it is time to part.

In 1936, when he wrote the preface to *Aftermath*, Frazer saw *The Golden Bough* primarily as a clue in the maze. He wrote:



At the best the chronicle may serve as a warning, as a sort of Ariadne's thread, to help the forlorn wayfarer to shun some of the snares and pitfalls into which his fellows have fallen before him in the labyrinth of life.

In Frazer's epic of ascent, two other metaphors seem significant. One is the use of electricity or explosive for the dangerous powers of magic or *mana*. The savage regards his chiefs and kings, Frazer writes, "as charged with a mysterious spiritual force which so to say explodes at contact." Elsewhere: "In short, primitive man believes that what is sacred is dangerous; it is pervaded by a sort of electrical sanctity which communicates a shock to, even if it does not kill, whatever comes in contact with it." More elaborately:

Apparently holiness, magic virtue, taboo, or whatever we may call that mysterious quality which is supposed to pervade sacred or tabooed persons, is conceived by the primitive philosopher as a physical substance or fluid, with which the sacred man is charged just as a Leyden jar is charged with electricity; and exactly as the electricity in the jar can be discharged by contact with a good conductor, so the holiness or magic virtue in the man can be discharged and drained away by contact with the earth, which on this theory serves as an excellent conductor for the magical fluid.

The other metaphor is a military one, and involves no less than a war against Giant Superstition. Frazer writes in the preface to the second edition:

Yet sooner or later it is inevitable that the battery of the comparative method should breach these venerable walls, mantled over with the ivy and mosses and wild flowers of a thousand tender and sacred associations. At present we are only dragging the guns into position: they have hardly yet begun to speak.

In the new preface to *Spirits of the Corn and of the Wild* in 1912, still hopeful, Frazer writes of various things that "combine to draw men into communities, to drill them into regiments, and to set them marching on the road to progress with a concentrated force to which the loose skirmishers of mere anarchy and individualism can never hope to oppose a permanent resistance."

Running all through *The Golden Bough* is a sniping at Christianity, particularly in its Roman Catholic form. If the volcano underfoot is pagan superstition, the bloodstain of religion in the fabric is Christian history, and the darkness and mist, the trackless forest and labyrinth, the dangerous force or besieged enemy, are as apt to be the one as the other. "We must follow truth along," Frazer writes in the preface to the second edition, opposing it to the Cross; "It is our only guiding star: *hoc signo vinces*." Sometimes Frazer makes his point against Christianity by suggestion. In India a human god started in life "as the son of a carpenter." Of an absurd remark by the divine king of Iddah in Nigeria: "But such confusion, or rather obscurity, is almost inseparable from any attempt to define with philosophic precision the profound mystery of incarnation." Of the early Romans, "Thus the doctrine of the divine birth of kings presents no serious difficulty to people who believe that god may be made flesh in a man, and that a virgin may conceive and bear him a son."

Sometimes Frazer points more directly at Christianity. Lumping together temple prostitutes and nuns, "It is thus that the folly of mankind finds vent in opposite extremes alike harmful and deplorable." Frazer writes generally:

In the light of the foregoing evidence, stories of the miraculous birth of gods and heroes from virgin mothers lose much of the glamour that encircled them in days of old, and we view them simply as relics of superstition surviving like fossils to tell us of a bygone age of childlike ignorance and credulity.

Or:

Such tales of virgin mothers are relics of an age of childish ignorance when men had not yet recognized the intercourse of the sexes as the true cause of offspring.

Delighted to learn that the religion of Attis centered in Vatican Hill in Rome, Frazer writes: "From the Vatican as a centre this barbarous system of superstition seems to have spread to other parts of the Roman empire." After describing the unselfish social values of the ancient world, Frazer continues:

All this was changed by the spread of Oriental religions which inculcated the communion of the soul with God and its eternal salvation

as the only objects worth living for, objects in comparison with which the prosperity and even the existence of the state sank into insignificance. The inevitable result of this selfish and immoral doctrine was to withdraw the devotee more and more from the public service, to concentrate his thoughts on his own spiritual emotions, and to breed in him a contempt for the present life which he regarded merely as a probation for a better and an eternal. The saint and the recluse, disdainful of earth and rapt in ecstatic contemplation of heaven, became in popular opinion the highest ideal of humanity, displacing the old ideal of the patriot and hero who, forgetful of self, lives and is ready to die for the good of his country. The earthly city seemed poor and contemptible to men whose eyes beheld the City of God coming in the clouds of heaven. Thus the centre of gravity, so to say, was shifted from the present to a future life, and however much the other world may have gained, there can be little doubt that this one lost heavily by the change.

Citing an example of god-eating by a pariah caste in India, Frazer writes, without mentioning the Eucharist:

In Europe the Catholic Church has resorted to similar means for enabling the pious to enjoy the ineffable privilege of eating the persons of the Infant God and his Mother. For this purpose images of the Madonna are printed on some soluble and harmless substance and sold in sheets like postage stamps. The worshipper buys as many of these sacred emblems as he has occasion for, and affixing one or more of them to his food swallows the bolus.

Some pages later he gets more direct:

Yet a time comes when reasonable men find it hard to understand how any one in his senses can suppose that by eating bread or drinking wine he consumes the body or blood of a deity. 'When we call corn Ceres and wine Bacchus,' says Cicero, 'we use a common figure of speech; but do you imagine that anybody is so insane as to believe that the thing he feeds upon is a god?' In writing thus the Roman philosopher little foresaw that in Rome itself, and in the countries which have derived their creed from her, the belief which he here stigmatises as insane was destined to persist for thousands of years, as a cardinal doctrine of religion, among peoples who pride themselves on their religious enlightenment by comparison with the blind superstitions of pagan antiquity. So little

can even the greatest minds of one generation foresee the devious track which the religious faith of mankind will pursue in after ages.

Bishop paraphrases a statement of Murray's to the effect that *The Golden Bough* "represented the most devastating attack anyone had made on Christianity since William Godwin." Bishop agrees that it does, and does so deliberately. "The author's strategy is conceived with great cunning and carried out with great art," he writes:

For however wide we wander, however deep we delve into the records of the past, we are always coming up against one being, the Vegetable God, who as the decapitated Texcatlipoca or the dismembered Osiris is strange, but who is not strange at all, once our astonished gaze has recognized the likeness, as Jesus.

Christianity is seldom mentioned; there is no need it should be, for Sir James naturally assumes that the main articles of the Christian faith are known to his readers.

Bishop's rejoinder to Murray is that for Bishop's generation *The Golden Bough* has not demolished Christianity, but glamorized it. He writes:

For it is also possible for us, regarding Christianity in the light cast from the sacred tree at Nemi, to find that it has gained as much as it has lost. Since it had already forfeited in our minds any special claims it may once have had as a supernatural revelation, these should be counted an inconsiderable loss. By extending its existence into the dark backward and abysm of time, it has gained, not only the respectability of age, but another authenticity. A religion less than two thousand years old had always troubled us; but now its tradition stretches as far as any imaginable race of man. It is shown as a heritage, not from Judea and Greece only, but from the earth.

If Frazer read Bishop's article in 1936, one wonders what his reaction was. To have written his epic of humanity's ascent to rationality, climbing past the superstition and folly of Christianity, only to discover that he was preaching a more attractive syncretistic Christianity, might well have given him pause.

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EDITOR'S NOTE: This article on Frazer, as well as the study of Charles Darwin which appeared in *New Mexico Quarterly*, Vol. XXIX, No. 3, are part of Stanley Edgar Hyman's preparation of a book, announced by Atheneum, New York, as *The Tangled Bank: Darwin, Marx, Frazer, and Freud as Imaginative Writers*.

*Bernard Epps*

## SAND SCULPTURE

He knelt on the beach with his back to the licking waves and packed sand into the shape of a sleeping fawn. Two finished figures stood ahead of him about six feet apart and in direct line with the hotel; one, a kneeling camel, the other a mountain goat, both squat and fragile in the sunshine. There were three or four tourists standing around and a tin plate for their coins.

Seagulls hung on the sky like scraps of paper. Palm fronds drifted and floated in the heat and the people on the hotel patio had cool drinks at hand. It was the only hotel on the island.

*"Aren't they darling?"*

*"Sure."*

*"But WHY does he make them so close to the WATER? You'd think he'd KNOW the tide will destroy them!"*

*"Beats me, sugar."*

*"Maybe he needs the damp sand. But couldn't he CARRY the water in a BUCKET or something?"*

*"Maybe he's nuts! Somebody said he got shot up in the war. Maybe it addled his brain or something."*

*"O, HARRY! What a thing to SAY! I think the camel's just the CUTEST thing! If it was stone or wood or something I'd BUY it. We could put it on top of the television . . . ."*

*"Sure, baby! How about another drink? Jesus, it's hot! Waiter! Two more; plenty ice, eh?"*

The sculptor put a finishing touch to the sleeping fawn and squatted back on his heels. He cocked his head on one side, a strong, bearded head with pale eyes and streaks of gray in the hair. In other clothes he would have looked like a lawyer or a college professor, but here he wore the unmistakable soiled whites of a beachcomber and the deep tan of a European with many years under the Pacific sun.

He gathered his tools and dropped them in a box, emptied the tin

plate, bills and coins in his pocket, and dropped the plate among the tools. He picked up his hat and box and limped leisurely across the sands.

He passed the patio and someone called "Goodnight, Klaus!" and he raised his hand and smiled. Behind him the incoming tide was already licking the knees of his fawn.

"Do you know him?"

"Certainly," said the waiter. "Been here more than ten years now. Strange sort of joe but a real nice guy, you get to know him."

"Look, Harry! The tide's washing that little deer away! I think it's a shame! But how can you take home a sand sculpture?"

"I think he's nuts," said Harry. "But he looked healthy, by God!"

His hut was made of bamboo and wide leaves and was half hidden by the tropical undergrowth. Specks of sunlight filtered through the walls and scattered on the earth floor like bright insects. There was a woven mat, a low table, primus stove, lamp, a few books and cooking pots and nothing else.

He threw his hat in a corner and lighted the stove. He put water on to boil, measured tea in the pot and stretched full length on the mat. Outside the palm fronds rustled and birds called to each other in harsh voices and the waves could be heard lapping the sand with the regularity of heartbeats.

Klaus reached for his pipe. He was humming a tune from Prince Igor.

"Tidal wave!"

"What?"

"Tidal wave heading this way! Just came over the radio. Earthquake in South America! Everybody get up to the airstrip immediately! We're evacuating the island!"

"O, my GOD, Harry! What are we going to do?"

"Get to the airstrip! You heard! They're loading the bus."

"But, Harry, our THINGS!"

"To hell with them! C'mon!"

The kettle began to sing and Klaus made his pot of tea. He sat cross-legged and selected a book from the pile beside him—an anthology of Chinese poetry. The book opened by itself to the pages of Tu Fu and the sculptor reached for his pipe.

*. . . My mind was clear at coming  
But now I've lost my guide  
And rudderless my little boat  
Is drifting with the tide.*

A commotion intruded from outside, people calling, bare feet slapping the path. An excited native stuck his head in the door.

*"Run . . . Quick . . . Tidal wave . . . Everyone Airfield!"*

The excited head disappeared.

Klaus stared thoughtfully at the spot where the face had been, his pipe halfway to his mouth. The pages of his book stirred slightly.

*. . . Rudderless my little boat . . . .*

He struck a match and sucked flame in the pipe bowl.

*"Get the hell out of there, Buddy!"*

It was a soldier stooping in the doorway, flushed and angry at something.

*"Get the hell up to the airstrip as quick as you can!"*

*"No, thank you."*

*"Look, Buddy, there's a hundred foot wave heading this way and it'll wash right over this island!"*

*"I don't care."*

*"You got fifteen minutes. Planes leaves 0600."*

The soldier didn't wait for an answer and obviously didn't listen to the others. Klaus sucked on his pipe and watched the flecks of sunlight on the floor. His head was cocked on one side like a bird.

*. . . Rudderless my little boat . . .*

It grew quiet outside. The birds stopped calling and even the palm fronds were silent.

A light plane flew overhead and then another. They sounded as if they had nothing to do with the little hut of leaves.

The sculptor crawled out and stood in the coolness of evening. The birds began singing to themselves again and the leaves rustled busily.

## SAND SCULPTURE

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He limped along the path toward the beach, his pipe still between his teeth. A wind was rising and the palms began to bow their heads and another plane flew over, heading toward the sea.

The hotel stared at the sea with a hundred blind eyes and the sea stared back. Newspapers scuttled under chairs on the patio and several glasses were overturned.

Klaus limped slowly to the sands, puffing his pipe and listening to the waves lap regularly at the shore, breaking, climbing the beach, pausing, retreating to break, climb, pause and retreat again.

The sculptor squatted with his back to the waves and began shaping sand in the form of a kneeling colt. He was humming a tune from *Prince Igor*.





*Bernard Epps*

## A HOUSE OF CARDS

The streets were deserted. Buildings huddled together for warmth in the night, stared down at their hollow aisles where street lamps stood lonely, each haloed in a greenish mist. A derelict shuffled sullenly sleepward. The traffic light turned from red to green to orange to red to green . . . blind commands to the naked street.

A prowler car stood patiently at the curb and two cops in a diner gestured with the counterman. Light spilled from the restaurant window and lay absent-mindedly on the sidewalk, a soiled yellow puddle. A young man came and stepped carefully around the puddle. He strolled with his hand in the side-pockets of his coat and stared around at the empty night.

The light on the corner turned from green to orange to red . . . .

A cat leaped across the street and disappeared into an alley beside the Amusement Park. The startled silence closed down again behind it like a blanket. The Park was as silent as the moon.

The man stared at his reflection in the window of the ticket office; winked at himself.

Red . . . to green . . . to orange . . . .

A girl came, walking with her hands behind her and dangling a brown purse. She wore toreador pants, a gray sweater and their reflections met in the glass.

Hello, he said to the window.

Hello, said she.

The cat tiptoed from the alley, looked both ways and hurried back across the street.

What are we doing here, he said.

A fragment of moon climbed the east.

The rest of the world is asleep, she said.

The rest of the world is dead, said he.

They joined hands and ducked under the turnstile. Funland, it said.

They looked at the Penny Arcade and all the machines had their backs turned. They looked at the Haunted House and there was a plaster witch riding a broom. There was a shooting range (15 shots a

quarter) and a place to fish for bottles. Every Throw Wins a Prize. Thrills. Chills. Ride a Rocket Ship. Loop the Loop. Crack the Whip. The Octopus. All were silent and deserted, alone and idle in the night.

They came to the Merry-Go-Round and she climbed up and sat astride a painted horse. He sat beside her and they joined hands again. His horse was green and had only one eye and the tip of its nose was broken.

They listened hard for the music.

They sat a long time in silence and the vacant world was like a blanket around them. They looked up at the blind night sky but the sky did not look back.

He sighed and jumped and lifted her down beside him and they wandered on in the naked park.

In the shadow of the roller coaster he turned and kissed her and she hugged him and closed her eyes. His hands moved down her back and crushed her until he could feel the bones beneath the warmth of her skin and her heart beat against his own.

The moon climbed.

They moved on to the Caterpillar and the Hall of Mirrors and the Tunnel of Love. There were a plastic cherub and two painted hearts.

They walked hand-in-hand between the side shows. The Strongest Man in the World, it said. The Tattooed Fat Lady, it said. Lola, the Snake Girl. Wild Man of Borneo. Wonder of the Age. Paint was cracking from the walls and all the ticket windows were closed.

They came to a cage where monkeys were kept. She peered eagerly through the bars but the cage was empty.

There aren't any monkeys, she said.

There never were, said he.

A torn patch appeared in the sky. Dawn was creeping in. It began chasing dust along the pavement. A poster on one of the walls flapped wearily. Elect James (Big Jim) Blaire, it said.

He dropped her hand and they looked at each other sadly. She smiled and lifted her shoulders.

Goodbye, she said.

Goodbye, said he.

He turned and walked away. The light turned from orange to red to green and the Amusement Park settled down with the rustling dawn. Once or twice they looked back and waved.

A gull screamed and the silence collapsed all at once and shattered in a million pieces.



*Elroy Bode*

## MACBETH RIDES AGAIN

"Roy Macbeth done saved the day, sir, and he done it all by his lonesome!"

Well, now, to a more excitable man than Captain Fargo Duncan of the Texas Rangers, them words by a reliable old scout like Ezra Donalbane would of been cause for a right smart jubilation. But Captain Duncan, he jest set there in that headquarters tent of his and went on chewing tobacco. After a bit he inquired, calm-like, "By hisself, Ezra?" and spit a brown stream past the tent flap.

"Might near," old Ezra said, settlin' himself on a camp stool. "That Lootenant Knox Cawdor turned tail on us over at Persimmon Gap and left Roy to flush out them half-breed scalawags." Ezra slapped his knee and laughed. "Hee, hee, I'm tellin' ye, Cap'n, it'd make a hound dog laugh the way ole Roy had them fellers scootin' along through the cactus like a passel of roadrunners." Ezra sobered a moment and then added, "Course' now, you got to credit Sargent Banquo, too. He stood his ground and did a right nice job, for a boy."

Captain Duncan sat starin' out the tent flap, lookin' over the land and rubbin' his bunion the way he always done when he was doin' some high-level musin'. "Grannies, Ez," he said after a spell, "that was fine goin' for ole Roy. But it was all in a day's work for a Ranger. I hope he don't git the big head over a little *Injun* killin'."

If the Captain had been over in Peon Pass about that time and heard Roy and Bill Banquo talkin' as they rode back toward Ranger camp, he would of relaxed about Roy ever feelin' chesty over a fistful of mangy Mescaleros. He was just the same quiet, modest-like Roy Bean Macbeth everybody knowed him to be.

Long close to dark—about the time out west when everthing gits so blame still you can almost hear a rattlesnake belch—Bill Banquo happened to notice somethin' kinda strange about Roy's neckerchief.

"Say, Roy," he said, "you keep a-pullin' on that red bandanner of yours a right smart. You ailin'?"

"Nawww, Bill," Roy said, "my neck's jest a tad itchy, that's all."

They rode on a piece in silence, but Bill's curiosity was up.

"Now Roy, I'd almost swear you had on a white bandanner early this mornin'."

"Yep, same one, Bill. I reckon it jest got a mite stained around noontime."

Wellsir, ole Bill was sure curious now. He reached acrost his saddle horn and pulled off Roy's bandanner.

"Great Land o' Goshen, man yore whole jugler vein is ex-posed!"

"Pshaw, Bill, ain't nothin' ser'ous," Roy said. "It's jest a little arrer wound. I been keepin' it washed out good with my canteen water."

If any man alive was ever took back, it was that Bill Banquo. All the way to the Pecos River crossin', Bill kept sneakin' little awesome glances at his pard. He decided there weren't no doubt about it—there weren't a more braver man in the whole west than Roy Macbeth. And the more he thought, the more he got to comparin' him with what his grandpa had always told him about Davy Crockett, about how he was always gettin' shot up and stabbed and all—just like Roy. But even Davy, with an arrer wound, would rub on some tobacco juice or a little gun oil, jest to settle the sting some.

Chances are, if they had been takin' some other way back to camp, Old Lady Fate would never got the drop on Roy the way she did. For I'm convinced, that's all it was, jest pure-D Fate. Them three gypsy women had the whole of Texas and Mexico to be livin' in, but no, they had to pitch camp in that old God-forsaken mine, right at the edge of the Pecos crossin'. A feller a mile away that night couldn't help but see that black pot a-bilin' in the mine, along with a whole wagon-load of bats a-scootin' around out front. And Roy Bean Macbeth, one of the best Texas Rangers as ever climbed a saddle—he had to wade his horse right up to their dang front door.

All three of the gypsies came out. But Ole Mogul, she was the oldest: she put a bold eye on Roy and spoke out first.

"Howdy, stranger," she said. "You look like you could stand a good long stretch. How about comin' inside and restin' a spell and gettin' your fortune told to boot?" Then she started goin' on in that crazy way she had, cacklin' and lookin' over at her pals. "And I reckon I just might russle up a snort of hard likker, if I got my arm twisted right good."

Now Bill Banquo, bless his soul, he smelled somethin' funny right off and kind of eased his horse over to Roy's and whispered, "We better

not dally round here, Roy. You know how Cap'n Duncan is about reportin' in late."

But like I said, Miz Fate had got the drop on Roy, hard and true, and she never lowered her bead. Even while Bill was tryin' to whisper to him, Roy was shinnyin' down off his saddle like he'd been sittin' on hot bacon grease.

"Why, thankee kindly, ma'am," he said. "Yore right neighborly." And I swear if suddenly he didn't start coughin' kind of delicate-like, behind his hand.

"Now I tell ye," he said, turnin' and lookin' like an innocent lamb at Bill, "this ole gullet of mine is beginnin' to feel right queer. Bill, why don't you jest mosey on ahead and I'll jine up with ye later. A shot of this kind lady's likker might smooth things down a bit, and while I'm restin' I kin jest take a peek at this fortune of mine."

And before Bill even had time to let his jaw slack real good in surprise, Roy and them three gigglin' gypsies went prancin' arm and arm through that mess of smoke and bats and disappeared inside the mine.

That was the partin' of the ways for them two boon companions. What Bill should of done, a-course, was gone back in there with the butt-end of his gun and laid out Roy good and cold and carried him on in to camp. That would of saved everbody out west a whole mess of trouble later on. But Bill, bein' human, jest looked terrible put out and sad and rode on in to Fort Firness.

Roy, he was slap in the middle of actin' the fool. He struck out one hand fer likker and the other fer Mogul to read on, and before long he weren't worth killin'. He got to pinchin' the gals and drinkin' likker out of his boot and yellin', "Come on, now, lemme see some of this cross-eyed fortune you got tucked away." Well, long about midnight the gals started doin' some kind of little dance round the pot, ever now and then droppin' in a ragtag of somethin' or other. Then Mogul stirred it all up with a buffalo bone and started in singin'—if you could call it that:

Stringy tongue o' dead cayuse,  
Possum spit and maggot juice,  
Coyote paw, tarantula fur,  
Unborn pup of desert cur  
Lizards and frogs and rattlesnake pizen:  
Git yore magic spell to risin' . . .

She went on like that fer a while, and ole Roy—well, he jest looked bug-eyed and swigged from his boot and looked bug-eyed a little more.

“That’s yore future sizzlin’ there, pardner!” Mogul would say, cacklin’ and hoppin’ around the pot some more with them gal friends of hers. “And you know what all this here smoke and sputterin’ is sayin’, stranger? It says yore goin to be the next guvner of this here great big state. It says so in the palm of yore hand, and it’s sayin’ so right here in them bubbles before yore very eyes.” She’d giggle some more and says, “It’s yore birthright!”

Roy managed to catch a little shut-eye after all the doin’s quieted down, but bright and early the next mornin’ he galloped away from the mine like he had a fresh dose of salts workin’ in him and he never let up till he got to Fort Firness. But once he got inside Captain Duncan’s tent, why them high spirits of his jest sunk clean down through his jeans.

“Guvner!” the Captain yelled. “You mean to stand there and tell me that jest fer drillin’ a few skin and bone Injuns, so weak and porely they did good jest to stay right side on a hoss, you’re goin’ to end up guvner? Why, Roy, you addle-brained grizzly, you’ll do good to work up to Justice of the Peace . . .”

And the Captain kept it up till Roy backed plumb out of that tent. A couple of the Rangers standin’ near kind of snickered and winked at each other at how the Captain could always knock the wind out of a feller’s sails so.

Bout all I can say is, jest nobody knowed how powerful excited Roy got to feelin’ over that fortune of his and how good a holt Old Dame Fate had got on his senses. They never could of guessed that the old Roy Macbeth they always knew as bein’ so square and all was jest shucked out of his ole self as slick as a snake from its skin in the summertime.

Ever schoolboy with any learnin’ at all knows what happened after that. It’s all down in the books. But I bet most of them don’t know the inside of it—how quiet Roy played things at first and how deep his wife Annie Faye was roped in. Actually, now, she was the brains; she right off got grand ideas about how fine it would be to be a First Lady and have fancy socials and all. And she was the one who got Roy to invite all his Ranger pals out to Inverness Bar X for a go at chittlins and black-eyed peas. They was so ever-polite and innocent-like all durin’ supper they could hardly keep from lookin’ like cats hidin’ their mess. But afterwards, when the boys got all relaxed up playin’ their guitars out on

the gallery and started to drowse, you can bet Roy and the little woman didn't waste no time. They already had a signal worked out: when Captain Duncan finally began to snore Annie Faye was to clang on a cowbell in the parlor. Well, she done it, all right, and Roy dropped a pitchfork off the roof and caught the pore Captain right between his belly button and Bull Durham sack. There was a terrible amount of commotion, of course, the rest of the night, but Roy was pious-actin' and swore the pitchfork slipped when he was chasin' a varmit off the chimney. He didn't fool nobody, really—and least of all Bill Banquo: he'd been settin' in the outhouse at the time and seen it all.

But anyways, legal or not, that's how Roy Macbeth came to rule the west. When the Captain was laid to rest over in Slumber Gulch, Roy held his hat in his hand like the rest and sprinkled a little caliche on the coffin box when it came his turn, but when it was all over he clamped his hat back on good and lit up a cigar and said he weren't takin' any more lip about not being guvner. He rode on back home and got the sign Annie Faye had been embroiderin' on a cuptowel and he hung it out on the gallery fer everybody to see: "Roy Bean Macbeth, Peacemaker and Guvner, Elected at Berth." (Annie Faye had been to finishin' school back in San Antone, so she could spell the words mostly right.)

Now plenty of folks didn't cotton to what Roy did and his first week in office Roy had to drill eleven what he called "smart alecs". Pretty soon there weren't too many fellers around interested in votin' him out. But jest to be on "the safe side of good guverment," as he called it, Roy hired himself a legislature—Slim, Punkin, and Ornery Joe from out El Paso way. They took care of most of his major programs—like first bush-whackin' Bill Banquo down in Tumbleweed Flat. Poor Bill, of course, never had a chicken thief's chance and jest slid off his pony like an empty toe sack. Roy had himself printed up some handbills, too, that said that sissies and Injun-lovers and a few other "minority folks" were outlawed from the state.

I reckon it was a full year or so later, when things was mostly settled down and everybody was generally takin' Roy in stride along with the drought and the grasshoppers that he decided to throw his first Guvner's Ball. It weren't no real ball, naturally—jest a big Saturday night barbeque and likker bust. But it had the makin's of a right good stomp, with plenty of good hard fiddlin' and swearin' and carryin' on—that is, until Roy got so drunk he started seein' things. He was reelin' along beside the fishpond and happened to look down and there was pore Bill Ban-



quo's reflection lookin' up at him instead of the moon. That was the first thing. Then a while later he was eatin' a platter of Mexican enchiladas and by jing if he didn't see Captain Duncan jest a-grinnin' up a storm at him right through all the onions and yeller cheese. That was another thing that got his goat. Finally, to cap it all, when a couple of the old timers were bearin' down hard on "Turkey In The Straw", Roy saw Bill Banquo and the Captain promenadin' jest as pretty as you please, right up the gallery. That was when Roy really got a bad case of the jeebies. He jumped on the barbeque pit and fired ever shell he had in his sixshooters into a crock of tater salad. Then he yelled like a scalded Comanche, jumped on his horse, and lit out hell fer leather across the valley to the Pecos River crossin'.

When he got to the mine, he nearly scared a whole bucket-full of them bats to death, he was so wild-actin' and crazy. But the gypsies jest seemed glad to see Roy and began to giggle and prance around the pot like they did before. Before long they whipped up a pile of smoke that meandered around and finally ended up lookin' like a Stetson hat. Mogul play-acted and stuck her ole ugly head inside the hat and then made up another one of her little poems: "Killin' Banquo ain't enough; ye still gotta deal with Sheriff Macduff."

Wellsir, you would of thought Roy was goin' to pop somethin' vital, the way he laughed so hard at that.

"What!" he said, "that little sawed-off sandburr?" And he laughed some more and swigged a little more redeye and pretty soon he was all calmed down.

Another one of them gals started jerkin' her hands this way and that, mumblin' something that went: "He-men come and he-men go, but she-men always bring ye woe." Roy didn't rightly know what that was all about, but he allowed that since he already had outlawed sissies he wouldn't have no trouble with she-men.

After all the squirrels' teeth and bat wings had been swished around some more in the pot, Mogul waved her buffalo bone in the air and drew what she called her "vision": it was a feller hangin' from an old mesquite tree, and if you looked up close, there was a thorn or somethin' stickin' right through an openin' in his jugler vein. This set Mogul off to yellin': "Ye don't have to worry, ye don't have to kill, less'n Rio Grande waters come to Dunisnane Hill."

Roy jest about swallowed his snuff on that one. "Why, woman," he said, pinchin' her good and friendly-like, "there ain't been a flood on that river come within twenty-five mile of my placel" And he felt so

blame good about everthing he slapped each of the gals on the rump and started back towards home, whistlin' as peaceful as if he was a boy draggin' a tin can on a string.

Course he didn't have any idea what was shapin' up over at Colonel Juan Siward's hacienda right across the border. If he had, that happy little whistle of his would of curled up its toes and suffocated. Because little old scrawny Jasper Macduff from Poke Salad County, Texas, was plenty riled and there was fire in his eyes.

"Colonel Siward, that Macbeth gang won't stop at nothin' I tell ye. They done kidnapped my wife, shot my boy, and stampeded all my cattle off the ranch." The little man's eyes got kinda reddish right along here and his voice was all choked. "And Colonel," he said, almost in a whisper, "them was registered Brahmers, too. I was set to take a sure blue ribbon in the Ft. Worth stock show."

But then he kinda got a grip on himself and gritted his teeth and got down to business. He got the Colonel's say-so for help, all right, and without any trouble, but his big problem turned out to be somethin' he hadn't bargained for—the Colonel's troops. They didn't seem to have much spirit for fightin'. They managed to drag out a few long rifles and some gold-lookin' bugles and a couple of big drums and guitars, but they said they jest didn't feel much like marchin', hot as it was, and so they set down in the shade. Well, like I say, Sheriff Macduff by now was a mighty riled up and determined man. He threw back the buffalo rugs on his wagon and commenced passin' out the terquila whiskey and before nightfall he had himself a sure-nuff fired-up Mexican army.

So out they started with the sheriff and Colonel Siward ridin' up front yellin', "To the buzzard roost on Dunisnane, men" and fightin' slogans like that. And to show you now what real *thinkin'* that little feller had done, when that long line of thirsty troops crossed the Rio Grande into Roy's territory and took one last long swallow, Sheriff Macduff yelled: "Hold it, men; don't swallow!" And then he went on to tell how he was goin to be like the man Gideon in the Bible and was goin' to give a surprise to his enemy. They marched right on clean up to Dunisnane Hill in back of Roy's ranch house, their cheeks jest a-poochin'. Then the sheriff set the drums workin' and he yelled out, "All right, men, let's spit fer victory!" And by jings, it was a reglar waterfall.

This did a lot more than jest surprise Roy, I'll tell you; it jest plain flabbergasted him. He was out workin' in his okra patch when he heard

somethin' that sounded a little like thunder from the hill and then he seen a trickle of somethin' that looked like water come wigglin' down the slope.

"By Gadfrey," he yelled, droppin' his hoe and runnin' toward the stable to get his horse, "if this is some more work of them double-crossin' gypsies . . ."

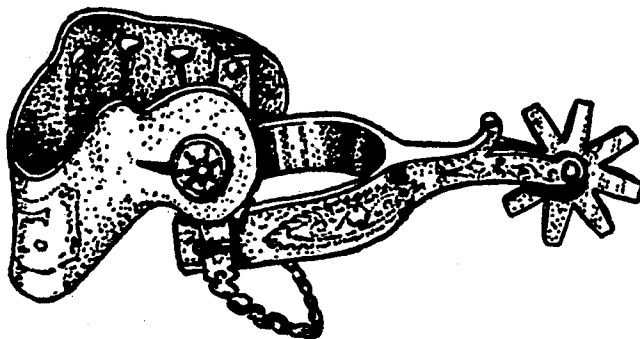
But he never even got time to work up a good cuss. Sheriff Macduff was already hid out behind the smoke house and he jabbed Roy right in the jugler vein with his long Mexican spur.

"Why, I'll swan, Jasper," Roy said, surprised-like and then he sort of flattened out in the horse trough.

The next minute you'd a thought a three-ring circus was breakin' loose in the barnyard. Juan Siward's boys, they started whoopin' and carryin' on and they finally hi'sted the little sheriff clean off his pony.

"Men," he chuckled, "that shore feels good. I was beginnin' to get a mite saddle-sore."

They packed Roy off in a clean pine box and set him out in Slumber Gulch and, if things ever went like they do in stories, that should of taken care of everthing jest dandy. But you know, strange enough, it weren't the end of Roy—not by a long shot. I reckon with his wild and woolly ways he had caught the fancy of folks out west, somehow. They actually missed him and went out on Sundays to visit with Annie Faye and swap old tales. Why, even today you can listen to a couple of Rangers as they ride down along the banks of the Rio Grande and one of them is bound to say: "You know, ole Roy could pick a right mean guitar, now couldn't he?" And his pal will finger his badge a little and nod and look out across the water, blowin' his nose with his finger, almost sad-like.



drawings by Horace T. Pierce

*Margaret Inman Meaders*

## THE CARIBE-CUNAS & THEIR JUNGLE MAGIC

One afternoon a few years ago a colleague brought into my office and spread upon my desk an armload of artifacts from a group of islands in the Western Caribbean. Weird, fascinating in origin and significance, those varied objects were to become my tickets to vicarious travels among a people who are perhaps the most primitive of all aboriginal North or Central Americans—the Caribe-Cuna Indians of Panama's San Blas Province and Islands.

The colleague was Clyde Keeler, biologist, geneticist, and fellow member of the faculty of the Georgia State College for Women. The artifacts included a Book of Snake Chants (crude symbols comprising "musical notes" and words of Cuna medicine chants); an enormous basket of assorted Caribbean "medicine" (objects believed possessed of supernatural power); a weird, great-nosed Stick Man or idol; a small beautifully carved wooden squirrel and a smaller stone mouse. They were brought to me because I was preparing articles on Dr. Keeler's two summers in the San Blas Islands, where he had gone originally to study the heredity, physiology and behavior of the famous albinos, whom the Cunas call "Moon Children." (The Caribe-Cunas have a bigger proportion of albinos among them than has any other group in the world; so Dr. Keeler's path, already having led him into close study of albinism, had inevitably turned in their direction.)

Today, Clyde Keeler is an authority on the Cunas—not only on the Moon Children, but on the people as a whole, on whom he has written a book, *Secrets of the Cuna Earthmother*. He returned summer after summer, drawn back by a new and consuming interest in the whole Cuna culture—especially, the religion. And as a result of his stories, his sketches, his photographs and extensive writings, and of the Chant Book, the Stick Man, and the Medicine Basket, I long ago developed my own deep interest in the geneticist's jungle friends and their daily lives, though I have never seen nor ever expect to see their primitive villages or their palm-fringed atolls.

The big and beautiful native basket packed with "medicine," the small, sad squirrel mourning for his native retreats hundreds of miles away, the Stick Man (*uchu mimmi*), and the Chant Book had all traveled by coconut boat from the coral island of Ailigandi east of Colon to the mainland of Panama, then across miles of unexplored jungles by bush-pilot plane, and finally to Georgia by commercial airliner. None of them had been long out of Cuna hands. That they had been given up at all was surprising; that they had been bestowed as free will offerings was amazing; for although the Cunas are friendly and gossipy within their own communities, they are suspicious and fearful of outsiders and do not welcome with open arms even brother Cunas from other islands.

The Caribe-Cuna Indians inhabit the wild, mountainous coast of East Panama and the fifty or so islands stretching along the Archipelago de las Mulatas from Punta San Blas to the Colombian border. It is an isolated domain. Chief contact with the outside world is the coconut boat, the *soo-ulu*. A few natives have gone from the Neolithic Age into the twentieth century and returned to establish schools and missions. During World War II a few American troops were stationed on some of the atolls. And now an occasional United Nations representative turns up here and there. But, by and large, the Cunas are little changed from their ancestors whom Columbus and his sailors "found" on the coast in 1502.

Scholars believe that the Caribe-Cunas then numbered around 600,000—perhaps 700,000. Now there are scarcely more than 20,000. The Conquistadores—beginning with those first sailors, who thought up the manly sport of seeing who could with the fewest blows decapitate the most Cunas—must bear the blame for the near-extinction of these colorful, talented, strange people of the Western Caribbean.

Because they occupy such an isolated domain, the islanders in particular have rather successfully managed to stave off "civilization" for close to five centuries. Not until the late 1930's was an occasional tourist permitted on even a few of the many atolls. Even today, without permission no outsider can remain on a Cuna island after dark, and most of the island towns admit no white visitors whatever.

At first, Clyde Keeler was not given the keys to Cuna council halls. Not the first summer. But by his third trip he was received upon the more important islands—Ailigandi, Narkana, Koetup, Mulatuppu, Tupili, Tuwala—like an old friend. Soon he was given a Cuna name "Kil-upippi" ("Little Uncle")—"Kilu" for short. And four years ago, after



#### MEDICINE BASKET AND CHARMS

Showing in basket, left to right: jaguar skull, skull of dwarf deer, wooden Nele; in front, stone mouse and piece of prehistoric wood. Outside, a pot for burning cocoabeans or hot peppers, a jumping stone, a twisted wooden snake, a spiny "Spirit Boat," a rattle for quieting babies, and a mourning squirrel.



THE CHART BOOK

It is held open by snake rattles and the skull of a red fox.



“KILU” KEELER AND SOME AILIGANDI FRIENDS

Dr. Keeler is now biologist-geneticist  
with the State Hospital of Georgia





CUNA GIRL IN NATIVE COSTUME

She has an ebony "beauty line" on her nose.

*Photographs by Clyde Keeler*

his talent as an artist and his sympathetic understanding of the Cunas had resulted in a written language—complete with primer and two readers—for these Atomic-Age citizens whose only “writing” had previously consisted of medicine symbols, the Cuna bestowed upon Dr. Keeler a formal medicine-man title. Now he is not only “Kilu” to them; he is also “Olotiekippi.”

The professor has spent much time upon Ailigandi, which is both an island and the only town on that island. Situated a mile east of the mainland, it has a population of around 1,400, though in size it scarcely equals four city blocks. Probably not one more cane-and-thatch hut could be squeezed onto some coral atolls; perhaps another all-purpose oil drum, but not another hut. Up and down the narrow lanes romp swarms of jaybird-naked little boys, leaving scant room for their somewhat older sisters, who lug on their backs baby sisters or brothers riding in miniature hammocks, a cloth version of the well known North American Indian baby board. The little girls and their mothers—all the feminine tribe of Ailigandi and the other islands, except those modern debs who are “wealthy” and have gone often to the mainland—wear plain headcloths and simple sarongs but gorgeous and intricately appliqued *molas* or blouses, golden nose rings, ebony beauty lines drawn down their noses, and quantities of jewelry. Necklaces and bracelets may be of shell (important both as decorations and as symbols), of commercial beads, or of coins—chief use to which Cunas put the white man’s money. Sometimes enormous gold-disc earrings hang to the shoulders. These days, many a young lady wears, along with her traditional jewelry, some trinket brought by Clyde Keeler as a gift from his Georgia students. On one trip he took along eighteen pounds of such gifts. His students also helped to finance the publication of one of the Cuna readers, prepared by Dr. Keeler and a native missionary.

San Blas men dress much like mainlanders, though brims of their handwoven Panama hats often appear fringed, and shirts and trousers are inclined to bag. This latter characteristic is explained by the fact that the women sew only for their sex in this matriarchal society, so the men must wield their own needles and thread. The same fact also explains the nakedness of the little boys!

Three things stand out in every Cuna village—the huts, the dugout canoes, and the *molas*. Just as the terraced apartment dwellings of Taos are much as they were in the days of Coronado, so the Cuna huts are little changed from those Columbus saw. Typical of the third period of the Neolithic Age, they are made of cane and sapling poles stuck

upright into the ground in the manner of stockades, with "rib" poles woven in and out near both the ground and the roof, to tie the verticals into walls. Roofs are steeply pitched and heavily thatched with bundles of palm fronds bound at one end. Narrow slits between the wall poles permit the inhabitants to see out, but—in most up-to-date architectural fashion—make it impossible for passersby to see in.

Despite this protection, the Caribe-Cunas have no real privacy as we know it. However, their homes are not yet invaded by the mechanical intruders that have taken over most North American homes—telephones, radios, TVs, newspapers, telegraph service, and the like. Even the jungle drum, that international symbol of primitive cultures, is absent. Cuna furnishings are few. Chairs are low stools chopped out of logs with the ubiquitous machete and the *adz*, basic tools of these people. Night lights are flickering torches, *kwallus*.

The beach is literally lined with long, beautifully sleek canoes. (Canoe, by the way, is of Cariban origin.) Occasionally, a boat is rolled up on its two log rollers to rest beside the owner's hut. Most Cuna canoes (called locally *cayucas*, probably from *cayo*, meaning "small island") are about twelve feet long and three feet wide; each is fashioned from a single tree. Most have masts and sails for long interisland trips; a very few have outboard motors.

*Cayucas* furnish the main means of travel, represent the major handicraft among the men, who are generally farmers and/or fishermen, and are of marked importance in numerous religious and civil ceremonies. For example, one all-community activity is the making of what Dr. Keeler describes as "sugar cane—parched maize beer." The beverage is concocted inside the Council Hall in an enormous ceremonial *cayuca*. A canoe also serves as a hearse. When a Cuna dies, his body is wrapped in cloth, bound with a braided-fiber rope, placed in its own canoe, and then drawn to the *uan* (cemetery) on the mainland. The entire funeral procession is a procession of canoes. And the trip of a Cuna soul to heaven is made in a miniature votive canoe called an *ulu ikko* (Spirit Boat or Sun Boat), which is moored near the *uan*, released by the Soul, and then paddled by the Soul up river eastward toward the Rising Sun, finally arriving at *Pap Kastipir*, the "port of heaven." A spare *ulu ikko* is placed in the grave in case the craft waiting on the river runs into trouble.

The most beautiful things on the islands are the *molas*, which incorporate the Cunas' chief art form—applied designs decorating those blouses. Like the turquoise jewelry of the Southwestern Indians, Cuna

*molas* represent the wealth of an individual and her family. They are both the daily and the ceremonial attire of the majority of San Blas females of whatever ages. A *mola* consists of a short bodice of plain cloth, which forms neck and sleeves, attached to two large rectangular pieces of cloth—the front and the back of the garment. These rectangles are gaily and often elaborately decorated with stylized, brilliant, imaginative appliqued designs, sometimes superimposed five layers deep one upon the other. Sometimes headcloths are appliqued to match.

The stitching by which the appliqued designs are attached to the *mola* is usually intricate and beautifully executed (the art seems to have developed indigenously); colors are fresh, bright, primary. Motifs are often amazing to outsiders: the Cuna needlewomen select common, everyday patterns, including dozens from the white man's world—most of which the artisans do not understand at all (canned goods labels, matchbook covers, cigarette ads, military insignia, even English words that appeal solely because of their patterns). Each woman fashions her over all design, either narrative or symbolic or both, into her own individual creation by using strips and cutouts of gay cloth and the elaborate Cuna stitchery to emphasize whatever linear pattern she has in mind. Many of the scraps of cloth are only two inches square. It is not rare to see, in the land of the Moon Children, an ancient pipe-smoking Cuna woman, bedecked in a colorful headcloth, a simple sarong, and an elaborate *mola* that would turn heads on Fifth Avenue, while with a wooden mallet she pounds corn in a primitive, hand carved wooden bowl.

The albinos—the Sipus or “White Ones”—are believed to be as they are because their mothers or fathers looked too long upon the moon. The hair of the Moon Children is as white as Caribbean sands; their skin is paler than the sun-dried palm fronds and tule reeds woven into Cuna baskets; their eyes are pale blue with coral-rimmed pupils; yet the Sipus are blood relatives of all the other Cunas, those whose hair—in contrast—is as black as the juniper juice which they smear on Cuna babies to frighten the devils away and whose skin is as dark as jungle water and whose eyes are as black as the dead coals in the incense pots in which the Cunas burn hot peppers or cocoa beans to drive away the evil spirits that bring hurricanes and other disasters. The normal Cunas believe the Moon Children to be especially beloved by Pap Tummat, the Great Spirit, and to be able to intervene with him for the entire community. It is the Sipus' particular task to shoot, with long, many-headed arrows, the Sky Dragon that swallows the sun or moon (causing

the white man's eclipses). When outsiders protest that even such formidable arrows cannot (without so much as a second "stage") possibly reach the moon, the Cunas reply, "Of course not; but it isn't the arrow that slays the Sky Dragon. It is the spirit of the arrow, which flies straight to his heart!" Cuna country is a world of, for, and by spirits.

Despite these powers and their position apart from ordinary Cunas, the Moon Children are considered unfortunate—so much so that for hundreds of years their dark-skinned brethren have taken systematic measures to eliminate them from the tribe. Only the recent realization on the larger islands that "civilized" people oppose infanticide has caused a diminishing of the practice.

One of Clyde Keeler's special friends in the islands is Manitiekinnappi, the albino Devil Driver and Medicine Man of Ailigandi. Dr. Keeler had, by his third summer, become well known on the larger islands because of his magic "talking book" (the primer). The more important Snake Men soon heard of the white *nele* (diviner) and wanted to meet their professional white brother. One of them, the great medicine man of Ailigandi, sought him out with a request for a business sign to proclaim his professional prowess, a sort of M.D.'s "shingle" for his hut. He had been told that Kilupippi could make him such a "speaking board."

So Manitiekinnappi brought to the "Little Uncle" his precious copybook of Snake Chants and "medicines," held secret for untold generations between the Eighth and the Tenth Parallels and here outlined upon the pages of a notebook and colored with wax crayons. So far as I know, it is the only such collection of authentic, ancient Indian chants ever to leave the possession of its medicine-man owner. When I first saw the book, it lay upon the broad, glistening skin of a giant tropical reptile. Rattlesnake rattles and a red fox's skull held it open at an important Snake Chant. Across the pages of the child's copybook, row upon row, marched seashells, butterflies, and batlike creatures, alligators, arrows, and armadillos, tapirs and tortoises, parrots, people, pots, peccaries, and palm trees. Each page or two comprised the musical score—words and music—for a complete chant. Holding his book before him, *Inatule* (Medicine Man) Manitiekinnappi could sing any of the important Snake Chants of his people. Certainly, not many such books have found their way legitimately into white hands; for such a collection is the dearest treasure of the Panamanian *inatule*, since it is at once his medical library, his license to practice, the teleprompter of any public display of his professional skill, and a private collection of

the prescriptions bequeathed to him by the masters under whom he studied in his youth.

Old Manitiekinnappi handled his copybook carefully, as Nostradamus must have handled his book of prophecies and Mme. Curie, her notes for isolating radium. He pointed out to Dr. Keeler a particular "scene" from the Snake Book to be used on the shingle—a representation of the Great Earthmother giving birth to the snakes. Then, fired with enthusiasm by the quickly completed sign, he wanted his entire book copied by one so skillful with pen and brush.

With proper reverence for the materials with which he worked, the Georgia professor made in three working days bright and symmetrical copies of the eight pages of sacred and powerful chant-and-medicine symbols in Manitiekinnappi's book. In return, he was given the original in a burst of gratitude from Ailigandi's Great One. More than that, in in unprecedented orgy of friendliness and professional sharing, Manitiekinnappi sealed the friendship of the white man and the brown (which had been initiated when the native made Dr. Keeler a gift of three eggs, pledge of lifelong devotion) by explaining every chant symbol in all its dark and secret significance, its fearful, hidden power.

Cuna chants are "read" and sung according to the order of the symbols, following each other across a page as musical notes follow each other. Also, the meaning and the force of the chants progress from one to the other of the symbols. The figures I saw were not at all badly drawn. I had the feeling that, given the "key" and taught the "scale," even I might have learned to croon a medicine chant.

Such "songs" are two in nature—medicinal and religious. One of the most extensive collections is that used during the Sacred Inna Ceremony, the "coming-out party" of a Cuna debutante. Included are at least seventeen dances and/or chants, among them *Inna Saiet Ikar* (Preparation Chant), *Tatar Nakwe* (Chant to the Rising Sun), *Tatat Arkwane* (Chant to the Setting Sun), *Purpake Namakke* (Chant to the Spirit), *Neki Namakket* (Chant of Blessing), *Ulu Sipu Tiwar* (Chant to the Spirit Boat), and an especially joyful song called *Onakwet Ki Namakke*, which "chants the Inna Feast up to Heaven." Another very important chant is the *Massar*, or Chant for the Dead.

Translated, these incantations of the Snake Doctors make a sort of native poetry. Take, for example, the cocoabeen medicine chant to restore the health of a sick child. (Note the substitution of the word *uncle* for the name of the disease. No illness is ever mentioned specifically, because of fear of the devil responsible for the ailment.) This chant

required a full page in the copybook. Dr. Keeler's translation is reprinted here with his permission:

This is singing to the little child:

Here you are in your hammock sick.  
Here you are in your hammock sick.  
You have lost your spirit.  
You have lost your spirit.  
You lie motionless in your hammock,  
Your little hammock.  
You shiver.  
Your hammock strings shiver.  
You dream of Uncle.<sup>1</sup>  
Do not dream any more of Uncle.  
Neles<sup>2</sup> beneath the hammock,  
Come close to this child!  
They will seek out your spirit in the Earth.  
They will bring it back to you.  
The Neles know what to do!  
I, the chanter, am here to guard you  
And to talk to you.  
Now your hammock quiets—motionless.  
Kilu,<sup>3</sup> the key is turned, the lock is opened—  
They go into the Earth.

Here, little spirit, they come into the Earth  
To find you!  
Ka!<sup>4</sup> Give forth smoke through their clothes  
And make them cough!  
The evil spirits cough—  
The evil spirit that has your spirit coughs, too!  
Neles! Go into their houses!  
Seek them out wherever they are!  
They are stiff with fright. . . .  
Uchu-Ka, go underground now!

1. Poetic name for the disease.
2. Wooden idols, in this instance, but usually doctors.
3. "Uncle"
4. Hot-pepper incense.

The Neles then search everywhere underground—in the frog's house, in the crater of the spring about the *ulu ikko* (spirit boat). They rush to the beach, looking into the crabs' holes, into the houses of the devils. At last, in the house of one of the demons, the Neles find the child's spirit where "it sits weeping." With nettles and staves they break into the devil's house, seize the offender, bind him, and cast him out. The chant ends

In triumph

The Neles are bringing back the little lost soul!

Not to be outdone by Manitiekinnapi's demonstration of deference and devotion and friendliness toward the white *nele*, another Caribe witch doctor Oloiklippilele, specialist in obstetrics on Narkana, brought an equally imposing and awe-inspiring gift, a Caribe-Cuna medicine basket, overflowing with articles guaranteed to achieve what only a combination of blood transfusions, oxygen tents, iron lungs, heart massage, and trips to our most fashionable spas can accomplish for the average white American hypochondriac. I handled those "cures" more than a trifle gingerly. There was the skull of a red, night-prowling jaguar that can make a child powerful and strengthen his mother; there was the small skull of a male dwarf deer, good for treating expectant mothers; and a large-nosed *uchu* (medicine doll, stick man), endowed with a magical living spirit that, through the magic invoked by the chants, could be sent into the earth's heart to rescue the spirit of an ailing citizen from the thieving spirits of selfish devils. As many as twenty spirits may inhabit a single Cuna body. One of these causes a man to think of Olopililele, the Great Spirit, who in many provocative ways parallels the blonde Quetzalcoatl of the Aztecs and Kon-tiki of South American primitives. If a devil steals that particular God-conscious spirit from a man, no chant known to the *neles* can save him from death.

The medicine basket held other things: the stone mouse, which possessed a spirit capable of wresting from demons the soul of a sick person; a piece of prehistoric wood, which could bring strength and virility to the weak; a gourd rattle, which had been used to quiet Cuna babies. A twisted, wooden snake was amazingly and disconcertingly life-like; a "jumping" stone fitted nicely and smoothly into the palm of one's hand, ready to be skipped across water; the little squirrel was the essence of sadness; deep within a conch shell the Caribbean murmured softly. There was also a pot for burning cocoabeans or hot-pepper in-



cense, both unpleasant to demons. And there was actually an *ulu ikko*—the small, spiny Spirit Boat, which Oloiklippilele had kept close at hand in case Cuna medicine failed (as all medicine must, now and then!) and a soul had to be transported to the Place Where All Souls Go on Trial.

The Caribe-Cuna medicine men believe that much good medicine is an application of a counter poison or charm to cancel out the effect of the evil magic that has taken hold of the sick person. They pride themselves on the fact that white doctors believe the same thing, and they point expressly to practices like vaccination and the use of antibiotics. Furthermore, the Cunas are not loath to draw certain parallels between their religion and ours. Willie the Penguin in his ability to talk and Mighty Mouse in his power to fly and Smokey the Bear and Venus-based astramen would find themselves completely at home and welcome among Caribe fauna-gods and *uchus*. Superman is obviously one of the white man's top gods, the Cunas say—a deity whom they accept without question. Much of our science fiction, which we are just now coming to find credible, is old hat to the Cunas, who have always believed in boats that can float to the stars and in spirits that roam the upper and the nether worlds and the world in between.

The most powerful of all the objects in the medicine basket which Narkana's witch doctor gave to Clyde Keeler was the *uchu*. The medicine dolls of the Caribe-Cuna are stylized anthropomorphic and zoomorphic wooden figures, used since time immemorial to scare away demons and plagues. They depict both human beings and animals—in accordance with Cuna primitive animistic beliefs—and are perhaps the most important objects employed in the innumerable exotic devil-appeasement ceremonies of the islands. These hand-carved figures are impressive in their formal simplicity. As sculptures they have power and artistry of execution. Those bearing close relationship to the island culture are representational in form; those—and there are many—that are reproductions of famous foreigners like General MacArthur and Uncle Sam (chosen for their power and aggressiveness and knowledge of foreign devils) are highly abstract.

*Uchus* are of two kinds, according to their assignments—town or island *uchus* and household *uchus*. The first are the guardians of communities; the second, the protectors of individual families. Stick men have mystical medicinal powers, according to Cuna belief. Usually, they get their directions from professional chanters, who send them in spirit underground to do battle with and conquer the devils (also,

spirits) that have taken away a person's soul and thereby made him ill. Recovery comes only if the *uchus* can bring back to him his purloined spirit. Some white visitors have believed that the wooden *uchus* are really Catholic *santos*, but Clyde Keeler most emphatically disagrees. He has it on good authority from many *neles* and *inatules* and *kapur-tules* (chanters) that the making of and relying upon *uchus* greatly antedates the use of *santos* in the Americas; furthermore, he has also seen far too many animal *uchus* to reconcile the stick figures with Catholic practices.

The largest collection of the medicine dolls the Georgia professor ever saw consisted of about 350 idols—the exorcising gods of Mula-tuppu. He also had an opportunity to examine carefully the collection of the Chief of Koetup, images used by the chief in the appeasement ceremony for driving devils off Koetup. Among those *uchus* were such figures as eagles, hawks, armadillos, alligators, jaguars, and lizards. The stick man in Dr. Keeler's collection was made of *suruk walla* wood, that had grown (or so he was told) in the Cuna Garden of Eden on Mt. Tarkarkuna before the Cunas' Great Flood!

Chants, wooden *uchus*, stone creatures, twisted serpents, spiny boats—not exhibits in a museum but completely contemporary in importance and "power." Not artifacts from a dead age or tourist purchases from a trading post or gimcracks from a souvenir stand, but invaluable adjuncts to a current culture, agents of a magic being invoked this very day, this very hour on Ailigandi and Narkana, on Koetup and Mulatuppu, on Tupili and Tuwala, south by west in the blue Caribbean.

*Louise Crago*

## AN EVENING WITH CRESPI

Summoned to Crespi's house for what he likes to call "an evening of talk" (which is purely euphemistic, since it is invariably, on my part, an evening of listening), I arrived at the appointed hour full of amused anticipation. Crespi loves to read me his writings, although I am not a professional critic. I should say he loves to read me them because I am not a professional, since Crespi does not want to be told where his stories succeed or fail in terms of plot, form, structure, meaning, etc. He wants, usually, merely an ear into which he may confide certain bashful secrets of how he came to write it thus, and what the girl in the diner said that made him wonder, and what o'clock it was when suddenly it came to him.

I like Crespi. And I like the literary impulse. Maybe one day I will write something of my own. But until I do, it contents me to listen to Crespi's work and then argue with him about its plausibility.

The wine bottle was already on the coffee table, which told me this was to be no leisurely night of modest feints and slow approaches. Crespi was burning with something, and I geared myself to be bombarded with truth and fiction in practically indistinguishable guises.

"Now," he said, leading me in, "Now," as if we had already spent a conventional time in preambles, and were at last getting down to the meat of the matter. "This," he said, burning and glittering-eyed, "This is a new one. Finished today. Tell me what you think."

It is part of my appeal for Crespi that I refuse to be rushed. I do not plunge, pell mell, into literature. I take a bite and chew it well. Then take another. This gives him the maximum amount of eager anticipation that may be wrung from any given encounter, and allows him to watch my reaction, paragraph by paragraph. I took up the manuscript and began.

Crespi, the eager servant to my endeavor, made himself unobtrusively useful. He poured my wine. He put ashtrays within reach. He stole glances at my face without seeming to. He would not risk the prolonged stare that he desired, for fear of distracting me.

As I read steadily but slowly, he relaxed enough to gulp his own wine and light his own cigarette. He considered the ceiling. He wrapped his arms around himself and drifted in thought. If I so much as raised my eyes to check the direction of an ashtray before tapping my ashes, he sprang alert and encouraged me with rapid nods.

The reading took ten minutes, and when it was finished, I laid the manuscript on the coffee table and leaned back. Crespi clutched his knees and searched my face. I pursed my lips, then took up a cigarette and searched vaguely for matches. He thrust a flame eagerly toward me. I puffed and took a long inhale, and let it out in a pensive stream. He hugged his knees tighter and snuffled.

I picked up the manuscript and looked at the first page, frowning, then laid it down again. Crespi exhaled audibly. I opened my mouth, then closed it again and reached for my glass. Crespi snatched the bottle and poured me more wine, slopping some over in his nervousness.

I took a meditative sip and, holding the glass toward him, unwound my index finger and pointed it at Crespi. "There's no reality in it," I said. "No sense of reality at all."

Crespi turned slowly red, and speech rose foaming in his throat. "Reality! Good God, it's nothing but reality!"

"Not at all," I answered, and sipped. "It's what you would like reality to be. But not what it is."

"Reality," he said with infinite disgust. "If it's reality you want to discuss . . . What the hell has reality ever done for me? Except frighten me to death or bore me to tedium?"

"Very well," I said soothingly. "Very well. Granted that reality is a bore or a horror. That proves my point. What you've got here . . ." I waved a deprecating hand over his typescript, ". . . is obviously a fraud. Why, the thing's *entertaining*! It's . . . It's . . ." I searched for a sufficiently descriptive word, ". . . it's positively dramatic! I hate to say this, old man, but the bare truth is that it has impact."

"Oh God," moaned Crespi, clutching his head. "As bad as that?"

"Come," I said sympathetically, "drink your wine."

Crespi emptied his glass, and gazed into its depths with haunted eyes. "I'll tell you the truth," he said hoarsely. "I knew all along it wasn't going right. All the time I was writing it, I could tell. Things kept sneaking in . . . change-of-pace, form, meaning. I tried to tell myself they were only incidentals, that the reader wouldn't notice . . . but I . . ." He raised pleading eyes to my face. "Do you think, if I rewrote it?"

"Crespi," I said, "I'm not going to treat you like a child. I venerate

your true gifts too much for that. Let's look at it analytically." I picked up the manuscript. "Here, for instance, on the very first page—this woman Polly. To be blunt, it seems obvious practically from the first mention of her that she is—how shall I say it?—fascinating."

"Oh," said Crespi tremulously. "Does she really come across like that? I had hoped that character had overtones of . . . well, of mediocrity, at least. Not an overpowering mediocrity, of course; I don't claim that. But . . . I don't know . . . the way she was pictured in my mind . . ."

"That's the razor's edge," I smiled. "To get the character across as he is pictured in the mind of the writer. There is where nine out of ten fail, my friend. A writer may have any number of marvelous ideas and impressions in his mind, but, believe me, old man, if it's not boring on paper, it's not boring."

"I see," he said humbly.

"But even that," I went on, "is not the principal failing of this particular character. You start her out fascinating, but that might be rescued by the remainder of the story if it weren't for the fact, that, as things progress, she actually grows in character! She makes decisions, old man. She resolves."

Crespi took my words without flinching, but I could see the anger in his eyes, struggling for release.

"Look here," I said, "I hope you don't take any of this personally. I mean, surely you know I'm not trying to wound you?"

"No," he said, biting his underlip. "No, no, of course not. I want you to criticize exactly as you see it. If I've failed—well, I want to know it. Better to get it from a friend than from some impersonal stranger."

"Good man," I said admiringly. "As for the rest of it—there is, as far as I can tell in one reading, a total lack of monotony. Certain passages could be much more static than they are. There is a lamentable over-all tendency to amuse—I might even say, interest, the reader. You ought to watch that, by the way—I've noticed it in some other of your work."

"I'll make a note of that," he said, searching his pockets for a pencil.

"In short," I said, shaking my head hopelessly, "I don't think, if I were you, that I'd attempt to revise or rewrite this particular piece. Simply chalk it up to experience. Put it aside and go on to other, more well conceived pieces."

Crespi lit a fresh cigarette with agitated hands. He blew a shaft of smoke and faced me squarely. "Tell me one thing:—do you think I ought to give up writing entirely?"

"Oh, good heavens," I laughed. "There's always room for improvement. You mustn't despair."

"But this story," he said in utter defeat, "This story was my best, I thought. I still don't see quite how it could have failed so miserably."

I put out my cigarette and stood up. "The problem is one of reality. If you aspire to write passages so marked by a sense of the real, so permeated with life as it actually is, that the reader will find himself *living* your work, caught up wholly in the monotony and sterility of your images—then, my friend, you must give up your vivid mental world. Get out of that closed chamber of dynamic emotions and colorful incidents."

"I understand," breathed Crespi. "I think I've gotten a glimmer of the real thing at last! God, what an inspiration you are! This is what I'll do: I'll burn all these thought-provoking books of mine, to begin with. I'll shun the printed word, and the company of learned men. I'll take a job somewhere . . . bag-boy in a super market!"

"Now you're on the track," I exclaimed.

"Yes," he went on. "Nights I'll go home to a cold-water flat with cockroaches on the walls. I'll give up bathing, develop a speech impediment, practice nose-picking."

I grasped his hand and shook it warmly. "Crespi," I said, with tears starting in my eyes, "I feel I've been privileged to be present at the birth of an artist. I really feel that."

"Don't do me too much credit at first," he said emotionally. "Wait until I produce something really worthwhile. And it *will* come, I promise you. When I'm good enough."

We walked to the door in silence. "Well," he said shakily, "now the test begins."

"And remember," I said softly, "if it isn't boring on paper, it isn't boring." I opened the door and went out into the starry night.

## VERSE

WINFIELD TOWNLEY SCOTT

### UNCLOSING CIRCLE

The old widow lying alone at midnight,  
By habit—still—on her side of the bed,  
Can hear across the hall murmuring talk  
Of her daughter and son-in-law, also abed;  
Not their words, only the sound of things said.

And she remembers how as a small child  
Lying awake it was one of her mysteries,  
What her father and mother abed were talking about.  
Not quite closing a circle of histories,  
She falls asleep down a spiral of Christmas trees.

WINFIELD TOWNLEY SCOTT

## MASTER OF ARTS

*"Oh, God! Just lemme have an open  
drawer in which to t'row me pomes!"*

KENNETH LASH'S PRAYER

Still liking poetry—although not of course this new stuff:

"Browning

Is heady enough, my boy, if you learn to accept some idiosyncracies—

Ah, to be sure, there's Frost (who isn't bad)"—

He sits in the coziest office of what is known as the Department of English—

Desk, soundless rug, a shelf of Oxford Dictionary, reading lamps, easy chair—

And confers singly with his students in what is known as Advanced Writing.

A bachelor with an income, thick in body and tweeds and imported tobacco

He arranges on his desk ten Dunhill pipes direct from London, and listens

Patiently to the boy reading a theme aloud. And his interruptions

Are kind and accurate, for, unmentioned, he wrote—just for

himself—when he was young

And over the years he has become a czar of the individual word,

Of punctuation, paragraphing, and—as it were—of the subjunctive.

"Sheer?" he quotes, and gnaws at his mustache. "Sheer is a—

a good word not to use."

The boy will remember that and the taste of winter darkening

at the windows

But the room secure with the tidy fire that never seemed

to need replenishing;

Though most of all the pince-nez'd tolerant twinkle which alludes

Through a most cultivated noncommittal air

To amusement at ambition in the yet undefeated undergraduate.



WINFIELD TOWNLEY SCOTT

THE OUTCAST

I belonged to that tribe but I never danced.  
I kept the eagle feather close to my chest.  
Off in the night I shook to the pounce of feet,  
Dancing dancing dancing dancing together.  
I shivered to the rattle of turtle-shells,  
To the knock of the deer-horn, to the outcry  
Of ankle-bells that could be instantly hushed.  
I carried with me hidden the pouch of seed.  
If I could not dance could I belong to that tribe?  
In the darkness I watched tremendous gods  
So tall they were silhouetted against the moon  
That chilled the tallest, farthest mesa; I knew  
Each ten-foot god masked its fill of a man.  
Bird whistles and clacking of beaks. Zero.  
Their tilting rush into the village dwarfed it.  
They ran to bless but towered like avengers.  
They seemed so much like gods that they became gods.  
I shook to the dancing dancing I could not follow.  
Inside the masks I knew there were naked men.  
Where the wind in that hollowed canyon moans  
"Zufñi—Zufñi;" where I crept: bury me with the women.

VINCENT BARRETT PRICE

**READINGS NUMBER II**

Early in my life, soft in morning  
 I felt a bird die brightly  
 falling young and still through the arms of its lover . . .  
 I asked, "is this flight calling me to follow?" . . .  
 leaves fell flying . . . petals trickled  
 and I turned unconcerned . . .  
 but now the river is at the sea  
 and bright life dying loved is beauty . . .  
 but will I die in color . . . soft in morning sun  
 Remembering: leaves didn't die in morning . . . or petals  
 only in the noon . . .  
 Then I must die at night . . .  
 no one will see my falling . . .  
 hard and tired through the arms of my lover  
 hard and bleak by the arms of my lover-saint;

I will die at night.  
 Morning is the requiem for birds . . .  
 only for the flight that was meant to fall while the sun still rises.

Still, morning hates to die  
 death is shouted out in morning  
 night is cold and instant  
 death is whisperd in its darkness . . .  
 (is it a full day then that never dies?)

Tell me now free bird  
 what the death you fall in is full and bright  
 why mine must be in dark nothings . . .  
 tell me now if rising morning means melodious falling  
 if heavy night means drums and pounding . . .  
 pounding the blackness of my brooded life.

FRANKLIN DICKEY

ODE ON A GRECIAN URN

I

True as steel  
A blade, an edge  
Simple and eloquent,  
Elegant.  
Craftsmen true lines,  
True anything awry,  
Askew.  
Truth is beauty  
(The proposition is not reversible).

II

Beautiful as birds,  
A flight, a stream  
Simple and eloquent,  
Elegant.  
Waves make hills  
Make waves anew  
And mate.  
Beauty is truth  
(The proposition is not reversible).

FRANKLIN DICKEY

**ADVENT**

Two and two are four:

The first lesson I was taught,  
An article of faith, a creed  
I follow but can not believe.

And yet the maple tree  
And my own blood believe  
Because they were not taught  
But knew and have that wisdom.

I can not envy blood  
Nor leaves nor even engineers  
To whom this knowledge is inheritance  
Not learned but known  
From womb and germ.  
It is the old law  
Common as a stone  
And just as firm.

Grace implies a miracle to come,  
A dispensation and forgiveness,

And for that Metamorphosis I wait.

FRANKLIN DICKEY

**TRACTATE ON EDUCATION**

Only cannibals poke      Only cannibals scratch:  
    She gave me that line,  
        The old darling,  
    Emma J. Gardner,  
    Principal of Something Avenue Grade School,  
        deceased.  
Who now keeps the Eumenides in order.

ALFRED EBELT

**FROM FLORIDA**

I am the Seminole,  
    remember me?  
I was driven into  
    the swamp  
that you might probe  
    the stars.  
O how empty the space  
    from which  
we are launched into  
    Eternity.

CARL CARY

TWO IMAGES OF LOSS

I

Square heads  
of whiskered wheat,  
long and sleek,  
are curled in the throat

of the sun.  
The hips of the wild rose  
lantern  
a dusty road

and purple fleabane  
falls to earth  
in a light as clear  
as wings of the moth

that slowly fold  
on a field of stone.

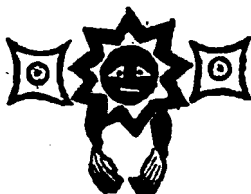
II

Frost strikes the hill  
with a fist of rime.  
Rains hurtle  
the sky.

A dissonance of crows  
seize the year  
in a garrulous  
beak;

days hang  
heavily,  
a rotting egg  
in a spinning nest,

no bird hatches  
in a season of loss.



## HEADNOTES

*continued from page 2*

☛ ELROY BODE received the B.A. and B.S. from the University of Texas in 1954 and was elected to membership in Phi Beta Kappa. Since then, he has served as a lieutenant in the Air Force and still holds a reserve commission; has taught school in Garland, Kingsville, Sinton and is presently teaching in El Paso, Texas. He has written previously for Texas Outlook, professional education magazine, and has contributed sketches about ranch life to the Southwest Review.

☛ From 1953 to 1955, CARL CARY, a West Coast poet who teaches school in Bothell, Washington, served in the United States Coast Guard. In the spring of 1961, the Quarterly printed the first poem he had ever submitted for publication, "The Sound of Rock," a surf-engendered sound as familiar to him as the

172 islands of his native San Juan County on Puget Sound.

☛ LOUISE CRAGO, who was educated in Charlotte, North Carolina, and at George Washington University, Washington, D.C., has written fiction for Artesian and book reviews for the technical press. Mrs. Crago resides in Fort Lauderdale, Florida.

☛ DR. FRANKLIN DICKEY, whose verse and reviews have appeared in the Quarterly, is chairman of the English Department of the University of New Mexico. Originally a scholar in German at the University of Wisconsin, his education was interrupted by military service of which he says, "I fought the Battle of West Texas and lost." He returned to the groves of academe at the University of California in Los Angeles where he received the Ph.D. in English. Since then he has taught at several

universities including Michigan and Oregon and was a Guggenheim fellow in 1958 when he did research in England and traveled on the Continent. More recently he has been awarded a Folger Library fellowship and Huntington Library grants. Dr. Dickey has published extensively in his field, the English renaissance. His *Not Wisely but too Well: A Study of Shakespeare's Love Tragedies* was published under the imprint of the Huntington Library in 1957. This year, Houghton-Mifflin is publishing his *Anthology of Pre-Shakespearean Drama*.

☞ Chairman of the Ogemaw County board of supervisors in West Branch, Michigan, ALFRED EBELT is a poet who is almost completely self-taught. He says he writes poetry "compulsively," and has never attempted a collection, but he consistently publishes a high percentage of the verse he submits. He regards his gift humbly but not without awe.

☞ Born in England, BERNARD EPPS has drifted over most of the North American continent, "the last nine years wandering and wondering," and has presently settled down in French Canada at Bury, Quebec, where he is hard at work on a novel.

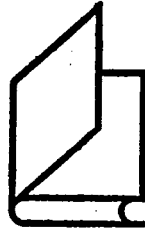
☞ STANLEY EDGAR HYMAN, author of *The Armed Vision*, is one of America's most distinguished critics. He is a staff writer of the *New Yorker*, book critic of the *New Leader*, and a member of the literature faculty of Bennington College. His article—a sequel to his "Darwin's Early Writings," which appeared in the autumn Quarterly in 1959—was written on a fellowship of the American Council of Learned Societies in preparation for his recent *Tangled Bank: Darwin, Marx, Fraser and Freud* (Atheneum, 1962). Others of his books include *The Critical Performance: An Anthology of American and British Literary Criticism of Our Century*, *Poetry and Criticism: Four Revolutions in Taste*, and the recent *Nathaniel West*, published by the University of Minnesota Press.

☞ Editor of University of New Mexico Bureau of Business Research, MARGARET INMAN MEADERS has lived in Albuquerque for the last seven years. She has won prizes for her verse, fiction, and editorial work which has included publicity, university press editing, and the teaching of journalism. Miss Meaders displays her versatility in this issue with both an article and a book review.









## REVIEWS

**THE LIFE OF SAMUEL JOHNSON, LL.D.,** by Sir John Hawkins. Ed. by Bertram H. Davis. New York: Macmillan, 1961. 371 pp. \$5.95.

The innocence of literary critics passes belief: you can put anything over on them if you say it in a striking enough way. This fine and full biography—it runs to 600 pages in the original edition—written by one of Johnson's oldest, closest, and most perceptive friends, appeared in 1787, three years after Johnson's death and four years before Boswell's *Life*, and has been allowed to remain out of print from that year until now, a century and three-quarters later. Why? Chiefly, it seems, because Boswell reported with relish that Johnson once said that Hawkins was an "unclubable" man (horrors!), and that, like all Johnson's biographers except Boswell, he was inaccurate and insufficiently appreciative of his subject; and because Macaulay, complaining of a life of Johnson in which Boswell, Mrs. Thrale, and others were chopped up and mixed together, quipped that all the ingredients except Hawkins' *Life* had been spoiled in the process: "Sir John Hawkins, it is true, loses nothing; and for the best of reasons. Sir John had nothing to lose."

It seems doubtful that Macaulay ever looked at Hawkins' book; he took his cue from Boswell; but the wisecrack was too good for Macaulay's journalistic instincts to resist. Boswell and Macaulay can be forgiven: they had their private axes to grind. What is hard to forgive is the successive generations of literary students who have swallowed this story without investigating it and so kept from readers what is not only a far better picture of the real Johnson than Boswell gives, but is in itself a first-rate piece of writing, well worth the attention of the connoisseur of biography.

Mr. Davis, in his earlier study *Johnson Before Boswell* (1960), established the claims of Hawkins' book to be taken seriously. Hawkins made mistakes; but certainly no more (and probably less serious ones) than Boswell. He "digresses"—that is, he fills in the background of bare biographical facts with sketches, often amusing and rewarding, of literary and social life in Johnson's London; but so does Boswell, who indeed subtitles his *Life*, "The

Whole Exhibiting a View of Literature and Literary Men in Great-Britain, for Near Half a Century." And Hawkins' "digressions" are not nearly so irritating as Boswell's impertinent personal memoranda, such as that in him, Boswell, who boasts of the name TORY, loyalty is not only a principle but a passion (the sort of remark that readers tend to assimilate to their picture of Johnson without noting that it is pure Boswell and nothing more).

Hawkins intrudes his somewhat dour personality into his book on occasion, but he does so openly. The effects of Boswell's handling of Johnson as a father-figure are far more subtle, far-reaching, and disastrous. Boswell, denied any affection by his father, the austere Calvinist judge, Lord Auchinleck, spent his life in desperate search for a substitute, and Johnson in pity allowed him to attach himself to him. But the person you have to depend on emotionally you also come to resent.

Bruno Bettelheim, in a brilliant review some years ago of Ernest Jones' biography of Freud, complained that Jones follows the time-honored tradition of disciples in subtly undercutting the master, demonstrating (in the most reverent way) his imperfections, and showing how he, the disciple, knows better—as, Bettelheim remarks, St. Paul did for Jesus. He might also have cited Boswell on Johnson. It has recently been established beyond a doubt, through examination of Boswell's papers, that Boswell sometimes resorted to the most flagrant suppression of evidence to preserve the "image" of Johnson that Boswell wanted to impose on the world—and for the most part succeeded in imposing on it. Hawkins may have been a curmudgeon; but he was not a neurotic of the order of Boswell and had no hidden urge to victimize Johnson.

For a long time the thing to say was that Boswell's was the greatest biography ever written. You found it said in every literary history. Again this was something Macaulay started, in his best journalistic manner: "Homer is not more decidedly the first of heroic poets, Shakespeare is not more decidedly the first of dramatists, Demosthenes is not more decidedly the first of orators, than Boswell is the first of biographers. He has no second. . . . Eclipse [a race-horse of the time] is first, and the rest nowhere." It is almost a rule with Macaulay that when he states something in this vein of ludicrous exaggeration, it is invariably nonsense. For it is hard to term Boswell's book a biography at all. It is a series of excerpts from his voluminous personal diary—those dealing with the days, during the latter two decades of Johnson's life, when he was in Johnson's company—introduced by a most inadequate brief summary, obtained at second-hand and often extremely inaccurate, of the first fifty-five years of Johnson's life, and patched together by even more inadequate summaries of the periods, sometimes two or three years at a

time (for Boswell lived in Scotland and came down to London only occasionally), when Boswell did not see him.

What are we to call a book in which we read this: "During this year [1770] there was a total cessation of all correspondence between Dr. Johnson and me. . . ; and as I was not in London, I had no opportunity of enjoying his company and recording his conversation. To supply this blank, I shall present my readers with some *Collectanea* [jottings about Johnson, of no particular date], obligingly furnished to me by the Rev. Dr. Maxwell. . . ." A biography? Surely not. It is an edited diary; and as such, it possesses the merits that Boswell's other diaries have—more, indeed, because Johnson's conversations certainly enliven what elsewhere are often the long, dull stretches of Boswell's life. After the first two or three narratives of Boswell's alcoholic bouts and copulations with servant girls, the reader's titillation rapidly wears off; all the rest are much the same. Boswell without Johnson is a dull dog indeed.

Hawkins' book is a biography—a serious and responsible attempt to set down in coherent order the significant facts of a person's life, and to make such sense out of them as the writer's lights afford. Hawkins was better qualified for this task than Boswell. He was a more intelligent, more experienced, better educated man than Boswell. He was a distinguished magistrate in London for twenty years; Boswell was never more than a strikingly unsuccessful practitioner at the bar (I don't think any scholar has yet worked out Boswell's average annual income from his profession, but it must have been minute; one reason Boswell so savagely slandered his competing biographers was that he desperately needed the money from the sales of his own book).

Although one still encounters the preposterous assertion that if it had not been for Boswell no one would now hear anything of Johnson, the fact is of course just the contrary: if it had not been for his attachment to Johnson, Boswell would never have emerged from the crowded limbo of minor eighteenth-century scribblers. His writings on Corsica might have rated a footnote in historical and geographical treatises; when his diary was discovered, a one-volume abridgement of it might have been published by some enterprising publisher—and not improperly remaindered; nothing else he wrote is of a quality worth noticing. Had Hawkins never known Johnson, his monumental *History of Music* would still retain the position it does today—along with Burney's, one of the great pioneering, and still indispensable, works of musicology. Hawkins had a clear understanding of Johnson's religious and political views, and provides admirable discussions of them—passages with which all students of Johnson should be familiar. Boswell, a Scot, and a Presbyterian by upbringing (with a youthful excursion

into Roman Catholicism), understood neither, and his desultory treatment of them has only covered both subjects with confusion. Most important, Hawkins was of Johnson's own generation and a not dissimilar background. They were struggling young writers together on the *Gentleman's Magazine* before Boswell was born. They were Londoners together, moving in the same circles, while Boswell was pursuing his amours on the slopes of Castle Rock in distant Edinburgh. At the end, Hawkins attended Johnson through the physical and spiritual agonies of his last years, was at his death-bed, and was appointed by Johnson his chief executor. In the last three years of Johnson's life, Boswell was in London a total of four months, the last time six months before Johnson's death, and was not even mentioned in his will.

What has now become the thing to say, in more enlightened Johnsonian circles, is that we must give Hawkins full credit for providing us with much useful information about Johnson, often in salutary correction of Boswell; yet of course we must still continue to acknowledge that Boswell's book is by far the greater "work of art." Mr. Davis says as much; I have said as much myself in print. But during this last reading of Hawkins, I have begun to wonder if this concession is justified. Hawkins' book is quite as readable as Boswell's, and it has a unity of structure and an impressive seriousness of purpose that Boswell's lacks. This is, of course, because Boswell's is primarily a series of journal entries: as "art" it may be good in its own genre (though it certainly cannot be compared to, say, Pepys's or the *Goncourts*). But it is not a biography—not even a book, properly speaking. Boswell is a diarist; Hawkins is a biographer, and shows that he has profited from the lessons and example of his friend Johnson, the first modern biographer as he was the first modern English lexicographer, and the first modern critic.

Biography, it seems to me, is a more serious and rewarding "art-form" than the diary—one in which artistic skill has more scope. And, it seems to me, Hawkins' is still the one biography of Johnson to which the epithet "work of art" applies, in the sense that it applies to Johnson's own fine *Life of Savage*; where one senses the result of the impact of the material of a work of art—Samuel Johnson's life—on an artistic sensibility: those subtle overtones of real and universal emotion that one also senses in the lives of Savage and Pope, and in other great biographies, like Lockhart's *Scott* and Lytton Strachey's *Queen Victoria*. Hawkins may have been "unclubable"; but he was something of an artist—a competent musician, music critic, and musicologist—after all. The "clubable" will no doubt prefer to go on chuckling over Boswell's reminiscences, and to visit casually with Johnson "the great Clubman," as F. R. Leavis sardonically labeled that particular "image."

Those who care more about Johnson "the great highbrow," the great artist with words and ideas, will find a place on their shelves for Hawkins.

Mr. Davis' editing and annotation are done with his usual skill. Not too much has been lost in the abridgement, which was carried out with great tact. The only disappointment is that an abridgement should have been thought necessary at all.

—Donald J. Greene

Dr. Greene, associate professor of English at the University of New Mexico and guest lecturer this year at the University of Toronto in his native Canada, is recognized as a foremost authority on Dr. Samuel Johnson. The recently published Volume IV of the bibliography, *English Literature 1660-1800* (Princeton) lists fifteen of his books, reviews and articles principally on Johnson published since 1950. He is the editor of the bibliography of Johnson published this year by the University of Cairo in Egypt.

AN EXPERIMENT IN CRITICISM, by C. S. Lewis. Cambridge: University Press, 1961. 144 pp. \$2.95.

As if host at his own "U" sherry party Professor Lewis chats with readers about reading. Genially, with Screwtape's tactical concessions, he reverses the traditional approach: he divides literary and unliterary readers by temperament and practice rather than by intellect and background; and books by the kind of reading they "invite" and "permit." The unliterary reader considers reading a last-resort pastime, obviating any creative response save egoistic castle-building. For the literary reader, on the other hand, life without thoughtful, receptive reading is barely conceivable. A good book rewards the surrender it exacts of the literary reader.

Denying there can be a taste for badness, Lewis distinguishes "use" of art, music, and books (or bad taste) from "reception" of them (or good taste). (It strains this distinction to apply it to other areas of taste, e.g., dress, furnishings, cuisine, etiquette.) He defines and places myth, fantasy and romance, realism, and prosody and prose with reference to literary and unliterary readers. Protective in his love of books, he wants to save them from desiccation by pedants, vivisection by critics, and inhumation by zealots from the Republic, whom he calls the Vigilants. In his fairness he may seem too inclusive. After all, as long as a single reader finds a book does more than feed curiosity, excitement, and vicarious pleasure, finds it, in short, both *Logos* and *Poiema*, Lewis will keep it within the pale of literature. Yet, if his theory has hiatuses, his practice in his supporting citations does not.

Throughout the soirée few reader-guests will contradict their urbane host.

—Marilyn Gaddis Rose

APPROACHES TO THE NOVEL, ed. by Robert Scholes. San Francisco: Chandler Publishing Co., 1961. 314 pp. \$1.95.

THE NOVEL AND THE READER, by Katherine Lever. New York: Appleton-Century-Crofts, 1961. 120 pp. \$1.35.

NOVELS IN THE MAKING, ed. by William E. Buckler. Boston: Houghton Mifflin, 1961. 266 pp. \$1.95.

DISCUSSIONS OF THE NOVEL, ed. by Roger Sale. Boston: D. C. Heath, 1960. 101 pp. \$1.40.

A poem, Valéry claimed, is like the Phoenix. Singly or generically, a novel is no-less so. Since World War II poetics of the novel (in Malthusian progression) have stoked its pyre and whether to temper with flame or smother with smoke sometimes has been hard to tell. In any event, the novel has thrived unimpaired and scarcely affected, although most critics—à la Edwin Arlington Robinson, have mistaken the combustion for the setting sun.

These guidebooks will not change it either. In fact, the editors (Miss Lever synthesizes the material the others anthologize) forbear direct handling of the divine plumed creature: novelist plus novel. They concentrate instead on the human collaborator: the reader. I rank the books in this order: *Approaches to the Novel*, *The Novel and the Reader*, *Discussions of the Novel*, *Novels in the Making*. However, all accomplish their modest purposes. Buckler documents selected English, American, French, and Russian novels. Scholes and Sale present well-known essays that try to bring order to the novel as a genre, while Miss Lever, who provides a program of self-study in the appendix, tries to bring order as well as present her own system of discriminating among great, good, and poor novels. Buckler serves chiefly the reader still in school. The others are more suitable for the out-of-school reader anxious to avoid dilettantism. But not eclecticism, for the editors are generous and catholic in their taste. Nevertheless, the nature of their task commits them to the Existentialist paradox: giving to the novel order which they themselves suspect is not inherent. The important thing—to recall the Phoenix from the fire—is to remember we are dealing with live prey, not a taxidermist's display.

Since the editors are obliged to work with novels already existing, they occasionally are obliged to forget this. Buckler especially. As fellow human beings, we are curious about the novelist's intention, aesthetic theory, and concurrent traumas. Such information sometimes helps us understand a novel. But it does not alter the novel. The adumbration may even divert us from the structure of style and meanings. At times, as with Bojer's *The Great Hunger*, perhaps with Camus' *The Fall*, we suspect a considerable

discrepancy between what the novelist thought he said and what he says. The other editors avoid the biographical critical approach. Scholes and Sale include Mark Schorer's "Technique as Discovery," and Miss Lever cites Schorer to corroborate her own judgment. They orient their material, not toward specific works, but toward the genre as a whole. Scholes' collection excels Sale's only in being more comprehensive. Their selections and Miss Lever's sources all overlap. Her book has the greatest apparent clarity because she organizes the sources by the lights of her own lucidity and expresses her synthesis with more simplicity than most of the novelists and critics she quotes. Yet her achievement cannot really be appreciated until these theorists have been read, and these and more Scholes provides. These books have scope, but hardly enough.

Not anything goes, but the novel does owe much of its resilience to its resistance to rules. Of course, Scholes, Sale, and Miss Lever gamely try to establish some boundaries. Miss Lever defines her own categories of fiction: novel (a long, original vision of reality in prose), fantasy, fable, and formula. Scholes and Sale by positioning emphasize Frye's categories. Scholes uses two essays from *Anatomy of Criticism*: modes of fiction (myth, romance, high mimesis, low mimesis, satire or irony) and forms of fiction (novel, romance, confession, anatomy). Sale includes only the latter essay. Either Miss Lever's or Frye's classification is clarifying. Frye's is more flexible because it allows for multiple combinations of forms. But they both distinguish merely the sub genres. I doubt that we shall ever define the novel.

After all, it is a genre emphasizing the written word (but a novel may also sound as it visualizes and rationalizes), seeking to encompass every conceivable human experience. We can be pragmatic with E. M. Forster and call it a fictitious prose work of at least 50,000 words, or esoteric with Robert Champigny and call it an aesthetic process in which thing is subordinated to quality. The fact remains that an inclusive definition is also inconclusive. The novel continues to absorb more and more provinces of the written word, e.g., journalism, philology, toponymy, and to dispense with more and more of its own conventions, e.g., grammar, plot, personages.

Dependent upon language, it is the genre least bound by its original language. Miss Lever says that translation is a test of a great novel. Yet parochialism is a failing of all these anthologies. Buckler even asserts in his opening sentence that the modern novel was not in existence when Defoe began the preface to *Moll Flanders* in 1722.\* Only Austin Warren in *Approaches*

\*In my opinion English literature had to wait until Jane Austen's *Sense and Sensibility* (1811) before it had a novel as coherent as Mme. de la Fayette's *The Princess of Cleves* (1678).



to the *Novel* recognizes adequately the novel in literature other than English, American, French, and Russian. Varied as these four are, generalizations based upon their novels cannot be as valid for, say, Baroja's *Paradox Rey*, Kafka's *The Trial*, Hesse's *Magister Ludi*, Lagerkvist's *Barabbas*, Jensen's *The Long Journey*, Gheorghiu's *The Twenty-fifth Hour*, or Andric's *The Bridge on the Drina*.

Having such malleable frontiers, the novel should last as long as literacy (if not eternally like the Phoenix). By and large these anthologies do not project. Miss Lever treats the novel as a genre with a future, although I suspect her insistence upon the verisimilitude of common-sense cause-and-effect will force her to call many novels fantasy and fable. Lionel Trilling and Irving Howe in *Approaches to the Novel* also discuss a developing genre. However, their companion essays, Buckler's anthology and Sale's, treat the novel as if its decline had begun. Thornton Wilder's nursemaid in *The Seven Ages of Man* ("Infancy") praises her pulp novel: "They don't write books like that anymore." But they never did.

A novelist succeeds only to the extent he transcends his poetics. Buckler includes Maupassant's concise descriptive aesthetics of the nineteenth century realistic novel. This is the preface to *Pierre and Jean*, a well-organized second-rate novel. Buckler includes also comments by Turgenev on *Fathers and Sons*, a masterpiece written from similar but more flexible aesthetics. All four anthologies take note of Henry James. Scholes uses "The Art of Fiction"; Miss Lever cites James in twenty footnotes and refers to him constantly; Buckler uses entries from the notebooks and the preface to *The Wings of the Dove*; Sale uses the preface to *The Portrait of a Lady*. Is not our exhilaration from these last-named novels undermined by a suspicion that it is out of proportion to its cause? We put in a *War and Peace*'s worth and get out a *Sister Carrie*-ful. Yet *The Bostonians*, where James' method is less evident, rewards more than it requires rereading.

Indeed, the incontestable masterworks of the western novel exhibit a disregard for the categories and advice of its critics. Miss Lever astutely observes that a novel's flaws may have as much value as its perfections. *Don Quixote* with its interpolated stories and its shifts of emphasis not only is impure picaresque but also lacks the unity of tone and meaning of the novels of chivalry it intermittently parodies. Perhaps Hawthorne should have gone over Melville's *Moby Dick*, regularizing its point of view, combining Starbuck and Ishmael, pruning the monologues, eliminating the cetology. After all, Lubbock in chapter XVI of *The Craft of Fiction* (Scholes uses chapters VIII, XI, and XVII) shows how Balzac's "pictorial" method of introduction

would have improved *Anna Karenina*. A good editor could have done a lot for Balzac, too.

The Phoenix need not reappear in the same form so long as we still recognize it. That is what happened with the turn-of-the century novel and the *entre-deux-guerres* novel and is happening with the post-war novel. The *Nouveau Roman*, e.g., Alain Robbe-Grillet's *The Voyeur* or Nathalie Sarraute's *Portrait of a Man Unknown*, discovers to us the quivers of our own perceptions. José Cela's *The Hive* and Carmen Laforet's *Nada* reveal a sensitive fusion of subjectivity and objectivity. Wright Morris infuses prose with the intellectual allusiveness of metaphysical poetry in his Gordon Boyd duo. Saul Bellow revitalizes the picaresque, a sub-genre until recently a statistic of literary history. Flannery O'Connor combines sober realism and phantasmagoria. Criticism of the novel must remain after the fact.

These four useful anthologies remind us that our reading of the novel should be critical and creative. But I predict the Phoenix always will stay at least two reincarnations ahead.

—Marilyn Gaddis Rose

Mrs. Rose, whose Ph.D. is from the University of Missouri, is a teacher in the literature department of Stephens College. She has written articles and reviews for *The French Review*, articles in *Romance Notes*, *Rives* and *Forum*, and has reviewed for *Renascence* and *Books Abroad*. Currently she is working on a book-length study of Julian Green.

**THE EARLY NOVEL OF THE SOUTHWEST, A CRITICAL HISTORY OF SOUTHWESTERN FICTION, 1819-1918**, by Edwin B. Gaston, Jr. Albuquerque: University of New Mexico Press, 1961. 331 pp. \$5.00.

In 1819, when Poe was only ten years old, when Thoreau had just celebrated his second birthday, and before Hawthorne had published his first novel, the Southwest had already appeared as the setting for a tale of adventure. This first novel, *L'Heroine du Texas*, written in French by a visitor who signed only his initials, depicted the experiences of early French colonists in Texas and Louisiana.

By the time *Moby Dick* and *The Scarlet Letter* had been published, seven novels of the Southwest already had appeared. The general reader is prone to forget that along with gun and powder horn, an occasional frontiersman took along an inquiring, observant mind which absorbed his impressions. Such impressions, usually recorded in an aura of romanticism, survive today in forty novels written in the hundred years between 1819 and 1918. Fifteen were written before the Civil War, and twenty-five between 1865 and 1918. The fascination of the Southwest setting persists to this day, as any television viewer may bear witness.



Edwin B. Gaston, Jr., has made a critical study of these forty novels in *The Early Novels of the Southwest*. His interest is understandable, since he is both a native of the region and a member of the English Department of Stephen F. Austin College at Nacogdoches, Texas.

Dr. Gaston's study records, summarizes, classifies, and evaluates. The thesis of his work is threefold affirmation: that the Southwestern novels followed the Romantic tradition of European and American fiction of the time; that their development brought an element of mature romance; and that Romanticism evolved during the period from the naive to the mature in both form and thought.

The authors of these early tales were born into the Romantic tradition; thirty-one of the forty were Anglo-Americans. They included people from every walk of life: archaeologists, colonists, cowboys, doctors, soldiers, politicians, and even housewives. A few visited the region only briefly, returning home to write of it; others remained to have a part in its development.

*The Early Novel of the Southwest* begins with a discussion of the general trends of the American novel during the period covered, followed by a survey of the fiction of the Southwest, showing its place in the general pattern. The subject matter of the novels then comes in for thorough discussion and classification.

The material of the early novels touches many phases of frontier life. Earlier tales as *Francis Berrian*, by Timothy Flint (1826), were based upon travels in the region. The Texas-Mexican War furnished subject matter for several novels, including one written "By a Texian," with the non-alluring title of *Mexico versus Texas* (1838). The pirate became a character in *La Fitte the Pirate of the Gulf*, by Joseph Holt Ingraham (1836). Later came tales of guides, trappers, and Texas Rangers. In the period immediately preceding the Civil War the woman writer made her appearance in the person of Augusta J. Evans, with *Inez*, a romantic novel of the Alamo. The Civil War period produced no Southwestern fiction except two anonymous novels, *The Yankee Slave Dealer* and *Cotton Stealing*.

The first Southwestern novels after the war were didactic and sentimental. More than *She Could Bear*, by Hesper Benhow (1872), and *Remember the Alamo*, by Amelia E. Barr (1888), are typical of this era. The tales of Kit Carson and Buffalo Bill soon supplanted them. In the nineties another phase developed an interest in regional manners and customs, dress, and speech, represented by Evelyn Moore Davis' *Under the Man Fig* (1895) and Opie Read's *The Arkansas Planter* (1896). The Negro entered fiction in the novels of Ruth McEnery Jackson, and the Indian came into his literary heritage in such novels as Adolph Bandelier's *The Delight Makers* (1890) and Marah Ellis Ryan's *The Flute of the Gods* (1909).

Subsequent chapters in this volume study the novel from many angles: plot technique, portrayal of character, impressions of geography of the country, intellectual and philosophical concepts represented. An epilogue gives a brief survey of Southwestern fiction since 1918, and an appendix offers synopses of the forty novels, many of them unobtainable today. A final section presents brief biographical sketches of the known authors, and a complete bibliography and index document the study.

*The Early Novel of the Southwest* is the work of a meticulous scholar, one fired with enthusiasm for his subject. It offers invaluable material, studied from every possible angle, to the student of American literature as well as to the lay reader with an interest in the region.

Dr. Gaston plans to complete his study with a second volume covering the years since 1918. Appreciative readers will look forward to the supplemental survey, and the two books will do a distinct service to Southwestern literature.

—Goldie Capers Smith

Mrs. Smith, a Texan teaching in Tulsa, is the author of three volumes of verse, a book, *The Creative Arts in Texas*, and has been a contributor to a number of national magazines of large circulation. She has lived and traveled extensively abroad.

NEW MEXICO CIVIL WAR BIBLIOGRAPHY, ed. by Jack D. Rittenhouse. Houston: Stagecoach Press, 1961. 37 pp. \$4.00. BACA'S BATTLE, by V. B. Beckett. Houston: Stagecoach Press, 1962. 30 pp. \$2.75. These two beautifully designed limited editions (limited to four hundred and eight hundred copies respectively) may make gift-item caviar for the Southwest historical buff. The bibliography in hard covers was compiled and designed by the director of the press, Jack Rittenhouse. It briefly describes thirty-two original documents relating to the War in New Mexico; it reprints and comments on a contemporary account in the *Santa Fe Gazette*, and refers to half a dozen other bibliographies. *Baca's Battle*, soft cover, recounts Elfego Baca's epic gun-

fight at Frisco Plaza, New Mexico, 1884, as reported at the time, together with Baca's own final account of the battle. The distinctive hand-set type faces and the papers used for these books are handsome, and rare indeed in an age of mass production.

**PATRIOTIC GORE: STUDIES OF THE AMERICAN CIVIL WAR**, by Edmund Wilson. New York: Oxford University Press, 1962. 848 pp. \$8.50.

A far cry from *Axel's Castle*, Edmund Wilson's 1931 study of the French symbolists and their influence on modern writers such as Yeats and Eliot, *Patriotic Gore* (at a cost of approximately a penny per page) is a highly perceptive and pragmatic study of the literature of the American Civil War.

No drumbeater, Wilson scotches once and for all the idea of celebrating the hundredth anniversary of the Civil War: he refers to it as "this absurd centennial" and quotes Robert Penn Warren's theory that two fraudulent traditions, in the South and in the North respectively, have been stimulated by the Civil War. Southerners latch on to the "Great Alibi," which enables them to blame everything in the South that is "lazy, provincial, barbarous and degraded" on the damages they suffered in the War. The North cherishes its "Treasury of Virtue," which, with its prideful notion that it has always fought on the winning side in any conflict, has enabled the United States to enter into all subsequent wars since the one Between the States. That snobish moral attitude appears first to have been engendered by the victory over the Confederate States in 1865. The "Treasury of Virtue" Wilson demolishes throughout his introductory essay in which he traces our behavior in wars, drawing a parallel between our "irrational instinct of an active power organism" and the vigorous voracity of a sea slug in the presence of another.

"The institution of slavery," says Wilson, "supplied the militant Union North with the rabble-rousing moral issue which is necessary in every modern war to make the conflict appear as a melodrama."

And *Patriotic Gore* draws on the writings and utterances of some thirty men and women who lived through the War, sampling in such a way that we see how people were moved to take sides—and in a way which sways us from seeing them as Northern or Southern stereotypes.

Wilson quotes from Sidney Lanier's little-known novel, *Tiger-Lilies*, the words of a poor white Tennessean named Gorm Smallin: "'Hit's been a rich man's war,'" Smallin says to himself, "'an' a poor man's fight long enough. A eye fur a eye, an' a tooth fur a tooth, an' I say a house fur a house, an' a bullet fur a bullet! John Sterlin's got my house burnt I'll get his'n burnt. John

Sterlin's made me resk bullets, I'll make him resk em! An' ef I don't may God-a-mighty forgit me forever and ever, amen!"

Wilson does not take sides. He adopts characters from each "side" and analyzes their human foibles in the time of distress. Harriet Beecher Stowe, Calvin Stowe, John S. Mosby, Mary Boykin Chesnut, Hinton R. Helper, Tom Sherman, Ulysses S. Grant, Abraham Lincoln, Robert E. Lee, and Oliver Wendell Holmes are among the *dramatis personae*.

Carl Sandburg receives the back of Mr. Wilson's critical hand for some of his practices in writing the biography of Lincoln. ". . . there are moments when one is tempted to feel that the cruellest thing that has happened to Lincoln since he was shot by Booth has been to fall into the hands of Carl Sandburg." Especially scored is a passage describing Lincoln in the days when he was in love with Ann Rutledge, of whom very little is known. "So often all else would fade out of his mind and there would be only the riddle of a pink-fair face, a mouth and eyes in a frame of light corn-silk hair. He could ask himself what it meant and search his heart for an answer and no answer would come. A trembling took his body and dark waves ran through him sometimes when she spoke so simple a thing as, 'The corn is getting high, isn't it?'" "The corn," comments Wilson acidly, "is getting high, indeed!"

The American Civil War period was not one in which "belles lettres" flourished, but many people were articulate: speeches were made, pamphlets written and distributed, private diaries and letters written by kerosene lamp or candle-stub, statesmen and generals gave in to needs—inner and sometimes financial—to write their memoirs.

*Patriotic Gore* is a wonderfully expressive study of the spate of writing that inundated the country before, during and after the Civil War. Some of the sidelights are funny: Mr. Beecher's remark upon hearing of the death of Byron: "I did hope he would live to do something for Christ," and Lincoln's reply to a man who complained that Sherman had threatened to shoot him if he left the army: "Well, if I were you, and he threatened to shoot, I would not trust him, for I believe he would do it." But the major effort is a superb documentation of convictions and conventions, of philosophy and prejudices, of impulses and issues that characterized the human conflict that was the Civil War.

—Ramona Weeks

Formerly book review editor of the *Quarterly*, Ramona Maher Weeks is engaged in writing books for children, poetry for adults, and still finds time for a generous number of reviews for *NMQ*. Recently she went to the cold north where she is executive secretary to the Academic Vice President of the University of Alaska. Her husband, Tim, is sports editor of the *Fairbanks Daily News*.

HERE COMES THERE GOES YOU KNOW WHO, by William Saroyan. New York: Simon and Schuster, 1961. 289 pp. \$5.95.

Those who remember the economic collapse of 1929 will remember the dingy, dismal, and desperate years that stretched on interminably thereafter. Bitter days, angry months, despairing years. The soul of every one who was fifteen years of age or older then is forever marked, forever maimed, by that bleak, hellish, traumatic eternity. Hopelessness, hunger, injustice, despair and more despair, and year after year after year: these wounds went deep and are indelible. There was no air, no light, no way out the mole-like tunnel. Then:

But Lord Christ! When I do remember me  
Upon my youth and on my jollity,  
It tickles me about my heart's deep root.  
To this day does my heart sing in salute  
That I have had the world in my own time.

These words of course are from Chaucer's randy Wife of Bath. They are nonetheless relevant. Suddenly in the grim 1930's William Saroyan erupted into print everywhere, pierced the gloom like the sun, and such words were what, incredibly, he too was saying. In his own language, but with the Wife of Bath's gusto and delight in life. To a generation pitched in poverty and darkness Saroyan in his stories glowed like the spirit of life, abundant, rousing, brimming with vitality and hope. Writing about his childhood in this volume he says, "It was great to be alive." In the 1930's in story after story crammed with humanity he insisted and demonstrated that it was great to be alive, and there are survivors today who, recalling that time, bless William Saroyan, artist, man, bringer of light. A lamp in the darkness, and a warmth in the cold.

Saroyan calls this present book an autobiography. In a way it is. If anyone wants a closer look at his family and childhood, however, he should read the earlier *My Name Is Aram* and *The Bicycle Rider of Beverly Hills*. *Here Comes* is fifty-two brief chapters of memory and mood. Chapter 1 is Saroyan's credo and a superb thing. It is more intelligent and vastly more genuine than William Faulkner's crapulous utterance before the Nobel Prize Committee which has received a spurious fame.

Elsewhere Saroyan touches upon literary style: "that snow falling is the finest style I've ever seen, and if I could ever learn to write the way that snow is falling my fame and fortune would be made." He discovers the only people he dislikes: "the vain, the pompous, the dishonest, the pretentious, the stupid, the crude, and the cruel." Not, be it noted, the young, the old, the poor, the uneducated, the decent. He remarks that he "writes more plays

more frequently than any other living playwright," though he sickened of commercial Broadway in 1943 and declines production of his plays. He tells of four years in an orphanage, age three to seven. He admits himself a compulsive, unregenerate gambler. He reveals himself an adoring father.

Oh, William Saroyan has his faults. Sentimentality, though that is rare in this book, no doubt is one of them. Loving, as he confesses he does, "kids and the aged," a writer is inclined to the maudlin unless he is dry and hard. Saroyan is seldom dry and never hard. Yet one remembers the grievous years of the 1930's and the solace and strength which Saroyan gave, and one cherishes him. Moreover if he doesn't write the way the snow is falling, surely surely he writes the way the green grass grows.

—Willis D. Jacobs

*THE ACCIDENT*, by Elie Wiesel. New York: Hill & Wang, 1962. 120 pp. \$3.00.

Memory and conscience—if only we could extirpate these demons, how bearable life would be. But suppose you have suffered searing brutalities; suppose you have witnessed horrors that never let you rest; suppose you have seen grotesque cruelties done by man to man and woman and child. Suppose you have survived a concentration camp in which your father and mother and sister were burned to death in gas furnaces at the end of the road.

Then how do you live thereafter? Whom can you ever trust? How can you love?

This is the century of killers and victims. In Nazi death camps alone millions of human beings have been massacred, in the coldest and foulest ways. Some have lived on in body; but their faith, trust, and hope have perished. Memory and conscience remain and corrode.

Elie Wiesel's brief novel is a story about one such man, now in New York City, struck by an automobile and lying in a hospital—hoping to die. He has "lost the will to live because he has seen too much of death; he cannot love because he has lived too long with hate." He undertakes the worst of survival: our suffering afflicts us, but it can also destroy others—those who befriend us, but to whom we cannot return friendship; those who love us, but whom we cannot love. The Nazis killed bodies; they also killed the capacity to feel. One has felt too much. Now one can feel nothing. Except perhaps loathing and disgust.

At the end of this book the young man promises to forget his memories, promises to forget those who died, promises to stifle his conscience. But he lies. He promises to love. He lies.

—Willis D. Jacobs

Professor of English at University of New Mexico, Dr. Jacobs frequently reviews books for the *Quarterly*.



LAST LECTURES BY ROGER FRY, ed. by Kenneth Clark. Boston: Beacon Paperback, 1962. 370 pp., 346 illus. \$2.95.

In 1933 Roger Fry was appointed Slade Professor of Fine Arts at Cambridge University. He was then sixty-seven years old, and not in the best of health. However, these inconveniences were characteristically overlooked; for, from his Cambridge platform Fry had hoped to organize his knowledge, put it to use in questioning art from Egyptian to modern times, and to test his aesthetic conceptions with new experiences. This was an ambitious program even for a younger, more robust man.

A year after his Cambridge appointment, Roger Fry died. His work was left unfinished. In this collection of his last lectures, first published in 1939 and now reprinted as a paperback, we see Fry exercising his analytic talents on the nature of aesthetic sensibility and vitality; and we see him exposing his impartial mind to Egyptian, Negro, Chinese, early American, and Greek art. But not included in the collection are Fry's views on the arts of the Renaissance and modern world, which he had expressed earlier. The *Last Lectures* therefore appear to neglect the works of Western Civilization, which is regrettable, for in Kenneth Clark's words, "His emotions before a bronze pot might be keen and sharp, but if the quality of his writings is any guide, they were less profound and lasting than his emotions before a Rembrandt. Such is the measure of our loss."

A central idea of Fry's is the idea of the pure aesthetic sensation. To define abstractly what he means by it has given him trouble. This is hardly surprising. But he seems seldom at a loss when asked to point out those works of art which generate the sensation; they are those which for him combine the qualities of imaginative design and sensibility. (Just where one should put "vitality" is a little problematical.) Throughout the lectures, Fry candidly gives his opinion on whether a particular work—be it a Negro pot, a Han drawing or a Greek frieze—has these qualities. He would insist that we look at the objects before us. And as we follow his detached analysis, we are at times led, at times seduced, to re-evaluate opinions based on perhaps a superstitious respect for antiquity, perhaps a facile attraction toward mere polish, or toward something that makes a frontal attack on our emotions. Thus Fry is harsh on archaic Greek sculpture—those stiff Apollos with simpering smiles which fashion once required us to admire; he is critical of Greek vases for exalting geometric perfection at the expense of sensibility; he is severe with German Expressionism for its loud insistence; and he is frankly repulsed by Indian figure sculpture for its pasty forms and gross sexuality. But it is

when Fry admires that the keenness of his perception becomes most striking. The *Last Lectures* show the range and depth of his appreciation, which may include, for instance, a Negro jug, a Siberian brooch, a pre-Angkor Khmer statue, and—surprise!—the Victory of Samothrace.

Here is the partial answer to the uneasiness we may feel as we read the lectures—the vague sensation of “*déjà vu*.” Isn’t it simply the new fashion to admire Negro masks and denigrate Greek athletes, to elevate the primitive at the expense of the sophisticated? If so, Fry himself was at least in part responsible for this new way of seeing. In any case, not many modish critics can so free themselves as to praise African fetishes as well as the Victory of Samothrace, and even to leave a kind word for the Laocoön. Snobbishness in art was in fact strongly distasteful to Roger Fry, and he combated it with a moral vehemence not unworthy of his Quaker upbringing.

Some 340 illustrations are included in this paperback edition of the *Last Lectures*. Unhappily they are detached from the text and put at the back of the book. And since the legends occur in a third place, reading can become rather jerky business. As I grope with the pages, my imagination at times flits to Virginia Woolf’s image of Roger Fry in the flesh, lecturing before the screen in a darkened room. There is his voice, sonorous yet courteous. There is his own tall lank shadow projected on the screen. Then there is the shadow of the pointer flickering down the folded robe of a T’ang Buddha.

—Yi-Fu Tuan

Dr. Tuan received his primary and secondary education in China, Australia and the Philippines. He is a graduate of Oxford and a Ph.D. from California. At present, an assistant professor of geography at the University of New Mexico, he has been an instructor at Indiana, a post-doctoral fellow in statistics at Chicago, and a member of an expedition plotting coastal terraces in central Panama. He terms his numerous publications “trivia,” one of which bears the trivial title, “The Misleading Antithesis of Penckian and Davisian Concepts of Slope Retreat in Waning Development.” Dr. Tuan lists among his recent hobbies all phases of Chinese culture which he can now approach as objectively as any foreigner.

**THE PEOPLE OF ARITAMA: THE CULTURAL PERSONALITY OF A COLOMBIAN MESTIZO VILLAGE**, by Gerardo and Alicia Reichel-Domatoff. Chicago: The University of Chicago Press, 1961. 483 pp. \$8.50.

The Reichels have provided their fellow anthropologists and the general public with an outstanding picture of a once-Indian community in the process of acculturating to Creole norms. Based on many years’ experience in the region and long acquaintance with the community itself, plus a period of fourteen months’ intensive interviewing and observation, the report is more

meaningfully detailed than many ethnographies. I say "meaningfully detailed" for a particular reason: The Reichels claim that their report is not a problem-oriented but simply a descriptive one, the implication being that they discarded a lot of theoretical baggage and simply described what they saw and what seemed to them to be important to the people under observation. The incisiveness of many of their observations, however, shows clearly that they do themselves an injustice in this self-evaluation. In fact, the Reichels appear to have rejected some of the oversimplified and analogical generalizations about culture change and acculturation, but to have retained an anthropologist's sensitivity to the worm's eye view of a society—to those features of social life which are likely to be important in interaction—and to those which sensible observation shows are important. This sensitivity, with which they hardly credit themselves, is theory, simply because it is not diffuse, but directed at particular aspects of social life. In this sense, the Reichels' implication of deficiency in their report and their defensiveness (again implied) about its "factual content" are unnecessary; they are too modest.

The volume begins with a detailed account of the "fundamental conditions of human existence": geography, general ethnography and history, food, health, and sanitation, and the life cycle. The second section treats the patterns of social structure: hierarchy, family, kinship, and other aspects of interpersonal and intergroup relations, property, production, distribution, and labor. Finally, attention is directed to the community world view, to its cognitive structuring of the universe, in sections entitled "Dimensions of the Natural," "Dimensions of the Supernatural," and "Dimensions of Consciousness." A summary chapter and an appendix on cures for diseases conclude the work. The organization of the book illustrates again the Reichels' basic concern with theory in the sense of meaningful structuring and presentation of data.

There are two portions of the work that are particularly impressive to me. One is the section on the structure and developmental cycle of the family. Part of my enthusiasm stems from the fact that this is an area of my own interest and part from the simple fact that the Reichels did an excellent job of analysis. Their findings on relations between spouses and between parents and children highlight and confirm features, such as matri-focality, suggested by other workers in Latin America, the Caribbean, and even modern London. The second impressive section of the work is that which deals with worldview (Part III) and related paragraphs throughout the book. The author's description and analysis is important not only from an anthropological but also from a humanistic standpoint. I have seldom en-

countered a description of cognition and motivation in the anthropological literature of this degree of perception and tough-mindedness. Here is a peasant society described in gratifyingly non-Rousseauian terms—shot through with conflict, insecurity, and a startlingly high rate of mental aberration. It is good, again, to find an ethnographer who is not brimming over with a sloppy affection for “his village” and a distaste for his own culture. The author’s attitudes say something not only about Aritama, but also about the whole of Colombian and Latin American society and about themselves, points also made by Gillin, Nuñez, the reviewer, and others; there is a good deal of the Protestant Ethic in Latin America, but it is concentrated at the extremes of the social hierarchy—among the despised Indians and among those of the upper fringe and the intelligentsia who have come to regard effort as a good and dissimulation and status-seeking as evils. What hurts most of all is the realization that so much of the United States seems to have been settled from Aritama. There is bias in this description, but it is at least a different bias from that often encountered, and it fits my own.

—E. A. Hammel

Dr. Hammel, an assistant professor of anthropology at the University of California, Berkeley, has shared with the authors the experience of living intimately in and studying closely a creole community of western South America. His *Wealth, Authority and Prestige in the Ica Valley, Peru*, a study of a coastal society south of Lima, was published this year by the University of New Mexico Press.

**THE OUTDOOR LABYRINTH**, poems by Myron H. Broomell. Durango, Colo.: The Herald Press, 1961. 30 pp. Paper, \$2.00. For this pleasantly printed volume, Colorado poet Myron H. Broomell has selected twenty-two poems in three groups, the first group of which consists of some adventures in human experience called “The History of Abraham Mousehold.” The second, “Ten Staves for the Conversion of Argentina,” stresses political themes. The third group, perhaps the best, “A Voyage to the Rocky Mountains,” contains eight short descriptive poems. A productive writer with several volumes of poetry under his belt, around World War II Broomell contributed a great many verses to *New Mexico Quarterly* (in the days when it had *Review* tacked to its title). A New Englander by birth, Broomell came West and in 1947 began teaching at Fort Lewis A. & M. College, Colorado. He has continued to comment on the world scene and the American West in such media as *Poetry*, *The Humanist*, *New Poets*, *Harper’s*, *New Yorker* and *Saturday Review*, and in anthologies. Most of *The Outdoor Labyrinth* is in straightforward rhyme with a scannable meter appropriate to the author’s themes. The poems have substance and meaning, and in each there is a narrative or philosophic event.—Roland Dickey

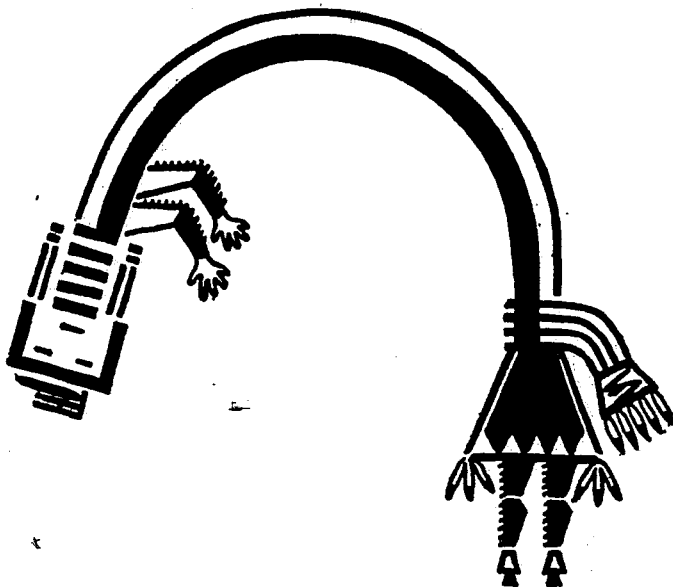
**INDIAN ART IN AMERICA**, by Frederick J. Dockstader. Greenwich: New York Graphic Society, 1961. 224 pp. \$25.00.

The Arts and Crafts of the North American Indian, the appropriate subtitle of this handsomely designed and lavishly illustrated volume, here have been accorded rich recognition and authoritative presentation. The large format, ten by eleven inches in size, has been used to particular advantage in the display of the two hundred fifty illustrations—seventy in color, many of them full-page in size. Dr. Dockstader, a well-informed anthropologist, has compiled a worthy record of Indian skills and has interpreted them with admiration and warmth.

The presentation begins with a chapter on the Indian as an artist, and undertakes to set up some ground rules for evaluations. Many preconceptions and judgments associated with European art must be thrown out; a majority of the rules taught in art appreciation classes do not apply, Dockstader says. However, he believes the basic role of the artist is the same in any culture: to arouse an emotional response in his audience. This surely would be considered a debatable statement, subject to extensive emendation, by many contemporary artists.

Art has been with man since prehistoric times, we are reminded; the urge to create something of beauty seems always to have been present. All tribes on the North American continent had some form of art expression, Dockstader has found, but the aim of the Indian artist was not merely to establish a realistic record—he sought out the spirit, or essence, of an object and represented it in his drawing or carving. It is this “semi-magical” character in Indian art which is difficult for non-Indians to comprehend.

Indian art is, of course, folk art, yet it contains many examples of fine art. In Indian terms there is no quarrel of art versus craft—the one leads to the other, and “any craft object becomes a work of art when exceptional creativity is accomplished by exceptional technical skill.”



Dr. Dockstader states flatly that there is no such thing as traditional Indian art, that the "tradition" may be no more than a few years old and introduced from alien sources. This is a curious thesis and will not bear examination, despite exceptional cases which might support it. Painting is given as an example of alien accretion: "the general style of water-color painting as we know it today stems largely from the Indian School teaching developed in the 1920's." This is contrary to statements long since made in detail by Hewett and Chapman, and more recently by Dorothy Dunn, the originator of the Indian School art department (*El Palacio*, February 1960). Any layman may confirm their findings by comparing contemporary paintings of ceremonial subjects, which comprise the great bulk of Southwestern Indian painting as we know it today, with panels from the Awatovi kiva murals (plate 12), or the Kuaua kiva murals (unfortunately, no example is shown), which are several hundred years old. The general styles are clearly similar; tradition through several centuries seems in plain evidence; the use of water colors and paper in today's paintings constitutes the only definite difference.

Any book on such a broad subject is severely limited; even two hundred fifty illustrations is a microscopic number compared to the number that could be made available. Selections come down to one man's taste, and the artistic examples available to him. It is explained why the choices are primarily from the collections of the Museum of the American Indian, New York, the institution which Dr. Dockstader now heads. Nevertheless, many items from other museums have been used and one can but wonder why the extensive collections in Santa Fe, which surely are superior in the Southwestern fields in many cases, were not utilized. (The small bowl shown, the work of María of San Ildefonso, is mediocre compared to a number of specimens in the collections there.) Indeed, one is struck by the paucity of Western material, especially in the Pre-Spanish section: sixteen items from the entire West are presented; there are fifty from the mid-west and southwest.

The Northwest coast seems heavily overweighted in the Historic Period section: seventy-five items are illustrated from that area, while just over one hundred examples are shown from all of the remainder of North America.

The photographs are on the whole superb. The color plates, printed in Holland "in rich black gravure and six-color offset lithography" are technically magnificent. However, there is an overall slickness (due primarily to excessive highlights, one feels) in the presentation, in the color plates and in many of the black-and-white plates, that prevents conveyance of the true nature and texture of the materials themselves. The reproductions of a number of the color plates, further, are marred by too-vivid solid color

backgrounds. Finally, there is too much emphasis on the grotesque, doubtless due to a search for the spectacular, in the items selected for illustration. One quibbles overmuch: it is simply that this splendid contribution to the interpretation and appreciation of Indian arts and crafts is so good it seems a pity it were not better.

—Wayne L. Mauzy

Wayne Mauzy lives in Santa Fe, where for many years he has been associated with the Museum of New Mexico.

**EXILES AND FABRICATIONS**, by Winfield Townley Scott. New York: Doubleday & Co., 1961. 207 pp. \$3.95.

For a man to publish a book with a title so private in its reference takes a kind of quiet assurance. One knows right off that the author is less concerned with salesmanship than with something in his own mind, and such literary independence these days, when most writers write what they think the market wants, is refreshing.

The essays in this unpretentious little book are in the tone of dignified individualism in attitude and judgment suggested by the title. They were separately written for various publications through some ten years, and Mr. Scott makes no attempt to weld them together into a unitary work. Each of the essays is an exile from a past experience once of high importance to the writer, and the result of bringing them together in a book is a fabrication in the sense quoted by the author from Webster's Dictionary: "to construct or build up into a whole by uniting . . . parts often made elsewhere." And the writer sees his own life as a fabrication out of elements in exile.

Though his essays range over a wide diversity of landscapes and personalities, from Newport to New Mexico, from Emily Dickinson to Mark Twain and Booth Tarkington, one finds in them an autobiographical communication. Scott is a modest man, reserved to the furthest remove from the showman whose chief exhibit is himself, but he does have faith in his own quality as a writer and a man. When he judges fellow writers, John Wheelwright, or E. A. Robinson, or Amy Lowell, the judgment is his own, not academically derivative, not an effort to come to terms with what others are writing and saying, but to express his thoughts and show why he thinks them.

That is how his personality comes through here, that of the quiet voice you notice when the others have stopped shouting and discover, somewhat to your surprise, that it's a voice worth listening to. I felt this quality of engaging self-revelation strongly in the fine essay on Whittier entitled in almost an excess of simplicity *Something About Snow-Bound*. The essay has a double subject: the poem, and the man writing about it.

The most autobiographical essay is the one called *Portrait of a Free Man*. Scott's "free man" is an unrenowned person he met in his youth and admired because he saw in him the courage to trust his own convictions and go his own way, like Thoreau, no matter how far it might lead him from success or public approbation. Joe Coldwell was (Scott's phrase) "a dedicated socialist." He admired Eugene Debs and Gandhi, never had much money, got into trouble with the police, and this posthumous portrait of him, drawn with a blending of compassion and regard, gives you not only Coldwell but Scott, as all good artists paint themselves into their subjects.

*Exiles and Fabrications* has the intimate quality of a book of poems; though not expressly autobiographical it is a personal document. It's a mild book, and literary mildness happens to be out of fashion, but in the quiet flow of its prose are sharp critical insights, ripples of humor and places of shadowed perception, and unstressed eloquence—a poet's prose for those who have a taste for unstandardized writings and attitudes.

—A. E. Anderson

Mr. Anderson, retired feature columnist of the *Oakland Post-Enquirer*, was for sixteen years associated with the English department of his alma mater, University of California, Berkeley, and for a decade taught creative writing at Orange Coast College, Costa Mesa. Interesting high-points in his long career include a youthful spell of teaching in the deep interior of China, three years as an olive farmer in the California foothills, and briefly as a staff member of the "New" Theater in New York under Winthrop Ames. Presently, Mr. Anderson lives in Laguna Beach.

*THE WANDERING OF DESIRE*, by Marion Montgomery. New York: Harper, 1962. 301 pp. \$4.95.

In reviewing this book, novelist Flannery O'Connor was (according to the unattractive dust jacket) inspired to declare: "The Southern writer can outwrite anybody in the country because he has the Bible and a little history. . . ." The remark is partially nonsense of course, for there is no section of the country whose writers do not have access to the Bible and a little history; but the rest of Mrs. O'Connor's assertion may not be greatly overstated. Certainly the South has begotten some of our finest contemporary authors. One needs merely to mention the names (not to speak about F. O'Connor herself) of such lights as Faulkner, Warren, Welty, Grau, Caldwell, and McCullers, to prove it; and the state of Georgia, which seems to be singularly blessed, has come up with yet another winner in Mr. Marion Montgomery, from Upson County.

Mr. Montgomery's first novel is a tale of life in the pine barrens and cypress swamps of southern Georgia during the 1930's. Essential element of the story is the struggle for possession of a piece of land known locally as the Hill—not



much of a hill by your standards or mine, but nevertheless a hill, because of its geographical location. ("It was a point to make reference from, surer than a live oak or cypress or one of the yellow pines . . .") Chief participants in the struggle are Wash (for Washington) Mullis, who wants the land because he wants it, and Jonathan Blalock, D.V.M., who wants the land (and finally gets it) for somewhat better reasons.

The story is of sufficient depth and breadth that to try and sum it up neatly within the scope of a brief review would do the book injustice. Let it merely be said, then, that Mr. Montgomery has penned his story with all of the perception, insight and craftsmanship that has made his conferees famous. However, there are a couple of notes in the symphony which are a little off key. The first concerns a Negro who is made to proceed at a steady trot for "seven or eight miles" while hanging on to a mule's off stirrup. It is only fair to explain that the narrator of this event is a person whose identity is known to the reader, throughout the book, only by the vertical pronoun, "I"; and the reader is soon permitted to understand that "I" (like F. O'Connor and all other Southern writers) is given to occasional exaggeration. The second false note also involves a Negro, one who performs an equally unusual feat:

That night he tore out the woman's womb with his bare hand and watched her bleed to death. Then he took the single-barrel twelve-gauge rabbit gun and went out behind the corncrib and blew the roof of his mouth in.

("It jes go to show you what come of a city nigger gittin a little piece of lan.")

Aside from these implausibilities, Mr. Montgomery's novel is remarkable (paradoxically) for its very authenticity. His character delineations are as sharp and revealing as a Walker Evans photograph, and the words, sounds, and assorted noises which he has put into the mouths of his characters are as accurate and true-to-life as any to be found on the printed page. By and large, it is an excellent book. Very impressive, very adult Southern.

—Jeryl W. Lafon

Jeryl Lafon, who will be remembered for his sensitive story, "Night of the Harvest," in a recent *Quarterly*, is a native of Alabama. At present he is with the U.S. Army Engineers District in Albuquerque.

**PILGRIM'S PRIDE**, by Marie Chay. New York: Dodd, Mead, 1961. 310 pp. \$3.50.

This book is a good book. It is one of those all too rare delights—a book perfect for reading aloud. To say as much about *Pilgrim's Pride* is to say a great deal: Here is a novel written simply, economically, charmingly, a book that over and over releases bursts of joyous laughter, that early creates and

then sustains a strong sense of anticipation made peculiarly satisfying by warm certainty as to what is surely going to happen.

From the outset the reader—and the listener—becomes personally involved in sharing certain universal qualities of Marie Chay's first-person novel about Italian immigrants ("my grandmother" Luisa and "my grandfather" Paul from the Piedmont village of Lauriano) who settled in a Colorado mining camp three generations ago. There is the nostalgia most adults feel for things and places and people known and loved in childhood but later lost forever; there is the sense of adventure experienced—even though sometimes unwillingly, as in the case of Luisa—when life sets us down in alien places among strange people and unfamiliar things; there is the superimposition of an Old World culture upon the free-and-easy disorder of a raw frontier, with the resulting strains and pulls upon loyalties and personal standards and long-held (and often well-loved) antagonisms on the one hand and hoped-for freedom of the spirit from such antagonisms, a willingness to consider new rules and customs, and an urgency to know new loyalties on the other hand.

These things are realized largely after the book has been laid aside, but they are its life blood—and this book is very much alive, indeed. During the reading, one is chiefly aware of the authenticity of characters and setting and situations and of the gaiety with which the story is told; of the affectionate but undeclared battle between emotional, quick-witted, consistently inconsistent Luisa (a Piedmontese to the death—an end, by the way, expected daily and momentarily from rattlesnakes, Indians, buffaloes, coyotes, and cowboys) and quiet-spoken, gently humorous, freedom-loving Paul, a true American from the moment in Italy when he determined to achieve for his family a home in a land where "we'll own ourselves."

Much of the action (and there is a surprising amount of action for a book largely concerned with the small but all-important daily relationships of warm but relatively "unimportant" human beings) revolves around Luisa's *bordinaus*, which she and Paul established in Berger's Draw, where he was a miner for the Progressive American Fuel Company, operating many hundreds of miles west of Nuova York. Sheer delight springs from many episodes—Luisa sallying forth to get rich by selling her vote at election time, Luisa setting out to select husbands for her daughters but being unwittingly out-manoeuvred by husbands and girls, Luisa hunting for the bushes on which (she had been assured in Piedmont) American *dohlulhrs* grew in bountiful supply, Lusia having her own temperance chickens come home to roost—most surprisingly—upon her own uplifted hand.

The tone of the book changes when the narrator's parents move away

from Berger's Draw to begin their own life together on a small Colorado ranch. The mood is gentler, more pensive, more aware of the little things of nature—seeds, calves, flowers, puppies, birds, children. This portion of the novel makes one acutely aware of the essence of what constituted “the good life” on Rocky Mountain cattle ranches—and farms everywhere—before dudes darkened the land or helicopters came to frighten the animals, or progressive education shadowed the doors of one-room schoolhouses, or radio and television intruded upon close-knit families tucked away in their small, happy world. One envies the clean definitions of such a life.

Marie Chay and her husband, Alex Warner, teach creative writing at the University of Colorado, where he is also associate editor of the *Colorado Quarterly*. Mrs. Warner inherited from her Italian grandmother the greenest of green thumbs and a culinary art approaching genius. About the people and the places in her book she says, “there was a *bordinaus*, a Berger's Draw, a Piedmontese grandmother, grandfather, father, mother . . . and all the rest in the coal mining section of southern Colorado, but only the places, with different names, and the animals are the same. Thanks to the imagination and memory, the people are no longer what they once were, and the harsh, sad and tragic events they often went through are now something that even they might laugh about.”

Many of the chapters of *Pilgrim's Pride* first appeared in publications like the *Saturday Review*, the *Arizona Quarterly*, *Prairie Schooner*, *Opera News*, the *Southwest Review*, and *Modern Age*. This novel is Mrs. Warner's first. The friends of Luisa and Paul, of Dino Asti, of Guilia and Emilio and Mico and Laura hopefully trust that it will not be the last.

—Margaret Meaders

Miss Meaders is widely experienced in university publishing, having been an editor, news bureau director, publicist, and assistant professor of journalism and English in Georgia before accepting her present position as editor for the Bureau of Business Research at the University of New Mexico. Among her publications in literary magazines are articles and reviews for the *Quarterly*.

**THE RELIGIOUS ISSUE IN THE STATE SCHOOLS OF ENGLAND AND WALES, 1902-1914: A NATION'S QUEST FOR HUMAN DIGNITY**, by Benjamin Sacks. Albuquerque: University of New Mexico Press, 1961. 298 pp. \$5.00.

This book will appeal to the scholars who have waited for an historically detailed account of the religious issue in English and Welsh schools. Forty pages of notes and twenty-three pages of bibliographic items indicate the range of documentation. This close attention to detail gives the work permanent value. Indeed, while other studies of a more popular nature and in a more interpretive vein may be written on this topic, it would appear that

Dr. Sacks has found and commented on all of the available, relevant sources. This is the kind of study a British scholar might excel in, and it is something of a tribute for a professor of history at the University of New Mexico to have conducted this study so well.

What was the point at issue?

Dr. Sacks sets the stage with an interesting analogy, rather briefly treated to my regret. Noting apprehensively Germany's growing superiority in industry and inventiveness, Britain in 1900 was in her relations with Germany in much the same position as the United States in 1960 in her concern over Russia's impressive scientific strides. One manipulable ingredient Britain saw was her schools. She could provide better education for as many youths as were capable of absorbing it. Many schools were conducted by voluntary bodies, mainly religious denominations. Having earlier decided to subsidize voluntary agencies which managed schools, having by gradual stages increased grants, and having enlarged the advisory power of local education boards, the state found itself faced with the imponderable question of religious instruction.

That religion was to be taught was an inevitable historical conclusion acknowledged by both church and state. But who should teach it; and how should it be taught; and how to safeguard the rights of dissenters, Roman Catholics, Jews, and other religious groups in a country with an established church, plagued the conscience of the British people.

There was, moreover, the question of training colleges, most of which were also managed by religious bodies. How were nonconformist trainees to be treated by a state needing more and better-prepared teachers? These are the knotty questions Dr. Sacks explores through an analysis of voluminous articles, speeches, editorials, sermons, tracts, and other documents issued at the time on this controversial topic.

Why does Dr. Sacks confine himself to the period between 1902 and 1914?

The book does in fact contain several pages on the Education Act of 1944, enough to round out the picture by showing relevance to recent times. But it was between 1902 and 1914 that the controversy was at its height. The lines of battle were drawn by the Balfour Act of 1902 regularizing aided schools. Long fomenting dissension among Anglicans, Roman Catholics, Nonconformists, and Secularists regarding religion in aided schools rapidly increased. The question revolved around Education per se versus Education and Salvation.

Into the fray jumped a host of contestants including, besides clergymen, the press and politicians. For this issue was one on which the Government itself floundered. Conservatives were pitted as much against liberals as fun-

damental Bible adherents pitted themselves against modern Bible interpreters. Something of the significance of the political implications of the controversy may be gauged from the fact that this study grew out of Dr. Sacks' earlier book, *J. Ramsey MacDonald in Thought and Action*. The religious controversy in state-aided schools was a crucial problem faced by the Labour Party's first prime minister.

In what manner the British capacity for compromise at last prevailed, I leave to the reader's pleasure to find out.

The lay reader, unless he is particularly interested, may not get far into this book. He may find it too analytical and detailed. The outcome of the religious controversy is there but one must explore with Dr. Sacks all the winding pathways. The imaginative interpretation one looks for in the first browsing is there but cautiously stated. Only by careful reading does one grasp the relevance of Britain's problem to the question of religion in American education.

But the book is not intended for the ordinary lay reader. Its appeal is to the scholar, be he historian, educationist, or theologian, with abiding interest in the moral upbringing of the young. To such as these for a long time to come the book will compel attention as a work of definitive analysis.

—Franklin Parker

Dr. Parker, who is an associate professor of the history and philosophy of education at the University of Texas, wrote this review in Lusaka, Northern Rhodesia, where during the past year he has been a fellow of the Rhodes-Livingstone Institute for Social Research. Dr. Parker's articles and reviews on aspects of the history of education have been published widely in scholarly journals.

**MACMILLAN'S FRONTIER WEST BOOKS.** This new series of juveniles earns high marks for both beauty at a reasonable price (\$1.95) and accuracy of detail in sugar-coated instruction. Written and profusely illustrated for children in from the fourth to the sixth grades, the series will number five books in all. The first three published are *Buffalo Land*, the story of the American bison; *Dog Soldiers*, about a Cheyenne warrior society, and *Silver and Lead*, the life and death of a mining town. Each of these books numbers forty-eight pages with over thirty large illustrations and inset cuts showing details of weapons, tools, flora, and fauna of the periods and regions covered. In spite of the space devoted to pictures, an astonishing amount of information is packed in the text which leads off with a map of the territory considered and ends with a glossary of technical terms and a bibliography of other somewhat more challenging books in case the young reader wishes to pursue the subject farther. The publisher's claim is not misleading: the West is presented "authentically and realistically."

## in **P**aper covers

**ON THE ILIAD**, by Rachel Besspaloff, intr. by Herman Broch, tr. by Mary McCarthy. New York: Harper Torchbook, Bollingen Library, 1962. 117 pp. \$.95. "Myth is the archetype of every phenomenal cogitation of which the human mind is capable," says Herman Broch in his lengthy introduction to Miss Besspaloff's group of essays on the mythical nature of the Homeric poems. Miss Besspaloff says it more simply: "It is not necessary to express everything in order to express the whole." The essays discuss aspects of character, feeling, and values in the *Iliad*, and the author is at her best in the evaluation of the central characters of the epic poem. "Apollo's protege, Ilion's protector, defender of a city, a wife, a child, Hector is the guardian of the perishable joys," whereas Achilles stands for "the port of war, the joys of pillage, the luxury of rage . . . the glitter of empty triumphs and mad enterprises." The essay treating the meeting of "Priam and Achilles," the old man having come to claim the body of Hector from his slayer, is masterful. It reveals further how Miss Besspaloff sees the *Iliad* as myth: "His (Achilles') courtliness alone, apparent in the grace of his welcome, betrays a man of high lineage in whom brutality threatens an already high-wrought civilization." Miss Besspaloff strains only when she seeks to couple War and Peace with the *Iliad*, in the essay "Troy and Moscow." "War, in the epic, appears first of all as a kind of prolonged spasm related to the rhythms of anger that are always ravaging nature, the great cosmic upheavals." The author does, however, discern a literary truth in her statement, "Anything destined for destruction and ignorant of its danger, or hoping to escape . . . is lit up with tenderness."

**FANFARE FOR ELIZABETH**, by Edith Sitwell. New York: A Macmillan paperback, 1962. 238 pp. \$1.65. "Watching the little child, leaping up and down in her father's arms, where the great fires lit the winter dusk, who could imagine this being as she would be in sixty-five years time—the old sandal-

wood body smelling of death, the beautiful hands that were like long leaves, grown a little dry from age, so that the lines on the palms were like those on a map? Then, too, she would leap into the air like a thin flame—like the flames she saw as she was about to die. ('I saw one night,' she told one of her ladies, 'my body exceeding lean and fearful in a light of fire.')

Edith Sitwell chronicles the girlhood of Queen Elizabeth as if the events were strung like a fairytale—the kingdom eager for a prince; the surly daughter, Mary; and the clever one, Elizabeth; the ghost of Anne Boleyn; the scandal surrounding Elizabeth and the Admiral Lord Seymour of Sudeley. The chronicle ends with Elizabeth's fifteenth year, having presented the background of the Elizabethan reign with all the care of a gardener nurturing a rose.

MARY TUDOR, by H. F. M. Prescott. New York: A Macmillan paperback, 1962. 454 pp. \$1.95. This is a sensitive and compelling biography of the "Spanish Tudor." Miss Prescott analyzes Mary's harassed and embittered childhood, the effect on her of her father's orders to betray her principles, which later she was to re-enact in her orders to Elizabeth to embrace the Catholic religion. Mary's great fault seems to have been her short-sightedness. In insisting upon her marriage to Philip of Spain, Mary argued that only Spanish orthodoxy was pure enough to rid England of heresy. Mary at last had her Philip, although his courtiers found her "older than we have been told"—she was nine years older than Philip—and the critical Spaniards said patronizingly that although she was "a perfect saint" she "dresses badly." Miss Prescott leaves Philip an enigmatic figure, which he was, but she lays firm grasp on the tide of emotions that surged and receded around Mary. After the wedding and the reinstatement of the nobles into the Pope's graces, they began to flounder in the hopes and anxieties of selfish interests. "The Pope had absolved them from sin. But would he leave them in undisturbed enjoyment of the fruits of sin?" In chronicling Mary's false pregnancies and Philip's growing indifference, Miss Prescott brings Mary around to the realization that in aligning herself with Spain she has alienated her English subjects. The book is a superb tapestry of the skulduggery, the desperate hopes and passions, from queens to candle-thieves, that marked the years after the death of Henry VIII.

ENGLISH ANCESTRY, by A. R. Wagner. New York: Oxford University Press, Oxford Paperbacks, 1961. 176 pp. \$2.25. A shorter, rewritten version of the author's earlier work, *English Genealogy*, this book summarizes characteristic pedigrees (such as those of pre-Conquest English ancestors, those who had

been, followers of William in Normandy, members of the gentry, people of professions, immigrants and emigrants) and indicates the limits of our knowledge of English ancestry in terms of status, record, names and continuity. The amateur genealogist will be both encouraged and discouraged by a summary account of the record materials on which genealogical knowledge rests and an outline of the ways in which they have been and can be used.

**THE CIVIL WAR: A NEW ONE-VOLUME HISTORY**, by Harry Hansen. New York: New American Library, a Signet Book, 1961. 644 pp. \$.95. A small-typed, narrow-margined paperback, which will serve, until a better comes along, as an inexpensive survey of the political antagonisms which led up to the Civil War, the first exchanges of shots, and the progress of the war. Some human sidelights break up the terse narrative: at the end of six desperate assaults against Marye's Hill, during the battle of Fredericksburg, an artillery officer reported that a chicken could not have survived on that field. The book manages a balance between battles and concurrent events in Washington. A great deficiency is the lack of documentation. There are no footnotes and a bibliography is conspicuous by its absence.



There's drama in cattle brands! Don Madriago's resembled the rolling hills of his California rancho, but rustlers, adding to their iron, changed his three hills to a frog face. Illustrations from *Written with Fire, the Story of Cattle Brands*, by Edna Hoffman Evans. New York: Holt, Rinehart and Winston, 1962. 87 pp. \$2.95.



"3-Feathers" brand of the Prince of Wales' ranch in western Canada.

More honored in the breach, the Maverick brand made fame by its absence. When a lazy cowhand did not burn it on the Texas lawyer's Gulf island cattle, the stock on the mainland became free-floating ten dollar bills, eventually sporting every brand but! So *maverick* was coined, meaning unbranded yearling, or, by extension, any animal or man astray, wild or unclaimed.





**THE WRITING OF FICTION**, by Theodore Goodman. New York: Collier Books, 1961. 222 pp. \$.95. Selected from lectures delivered by Dr. Goodman at City College of New York over a period of thirty years, these cogent essays probe "the whole fiction"—Goodman's term for the larger background of fiction as an art. Goodman isolates and discusses seven elements of the whole fiction: the word (as prose), imagery, character, pattern, emotion, idea, and conflict, although he realizes that the comprehensive quality of fiction cannot be achieved by adding together its various parts, any more than the dismembered parts of a chicken may be reassembled into a live fowl. Goodman, as teacher of writing, evinces a remarkable sympathy for the reader. It is this symptom of awareness, coupled with an extensive repertoire of references to literary works, present and past—the "bread-and-beans quality" of Defoe, the "vivid lacquered" symbolism of Poe, the "grand fooling around" of Artemus Ward that make Goodman's advice authoritative. Delightfully, he says that "the great tales of all ages are the circulating library of eternity." This is not a how-to book in the sense that phrase connotes. It is a volume that perambulates the reader past statues of performance, gives lectures on features and extremities—the tragic and the comic blemishes, for instance—and leaves him with standards by which to judge his own—or others'—stories.

**THE LAST OF THE INDIAN WARS**, by Forbes Parkhill. New York: Collier Books, 1961. 128 pp. \$.95. General William T. Sherman once defined a reservation as "a tract of land entirely occupied by Indians and entirely surrounded by white thieves." Mr. Parkhill's book is the account of the Utes' last-ditch stand for independence in the Four Corners area. The book takes structure around the figure of Tse-ne-gat, a young Indian boy, introducing him to the legends of his people and acquainting him with the depredations of range-hungry cattlemen, land-hungry railroaders, deposit-hungry coal miners. A certain inevitability exists in the boy's murder of Juan Chacon, a trespassing shepherd; and the irony of the Utes' last stand lies in the fact that while Tse-ne-gat underwent a lengthy trial, and was finally acquitted because of extenuating circumstances, white men clamped hold of certain areas of the reservation. Tse-ne-gat returned to his medicine men to be cured of his tuberculosis; they failed him, and he died, seeing this as his punishment for crossing the white man.

## **NEW MEXICO'S FOSSIL RECORD**

## *The Eighth Annual U. N. M. Research Lecture*

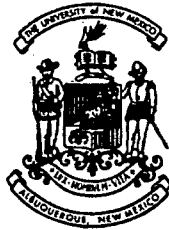
The Eighth Annual University of New Mexico Research Lecture was delivered on April 7, 1961, by Dr. Stuart A. Northrop. Now Research Professor and Curator of the Geology Museum at the University, Dr. Northrop has served this institution since 1928 as assistant professor, associate professor, professor, Chairman of the Department of Geology, Curator of the Geology Museum, and Acting Dean of the Graduate School. Primarily a paleontologist and stratigrapher, he has written several books (including *Minerals of New Mexico*) and numerous articles on the geology of Gaspé (Quebec), Colorado, and New Mexico.

A member of numerous local, state, and national societies, he was president, New Mexico Geological Society (1949-50); president, University of New Mexico Chapter of Sigma Xi (1955-56); chairman, Rocky Mountain Section, Geological Society of America (1955-56), and became an Honorary member, New Mexico Geological Society May 4, 1962.

Nine species of fossils have been named for Dr. Northrop, as follows: *Curculionites northropi* Cockerell, 1928, a scarab beetle from the Upper Cretaceous Fox Hills sandstone, Dupree, South Dakota; *Syringostroma? northropi* Parks, 1933, a stromatoporoid from the Silurian La Vieille formation, Jacquet River, New Brunswick; *Syndetocrinus northropi* Kirk, 1933, a crinoid from the Silurian West Point formation, Pointe l'Enfer, Port Daniel, Gaspé, Quebec; *Phragmoceras northropi* Foerste, 1936, a nautiloid cephalopod from the Silurian Gascons formation, Anse à la Barbe, Gascons, Gaspé, Quebec; *Spyroceras northropi* Foerste, 1936, another nautiloid from the Silurian Indian Point formation, Indian Point, Port Daniel, Gaspé, Quebec; *Domatoceras northropi* Miller and Unklesbay, 1942, a nautiloid from the Permian San Andres limestone, Bluewater Dam, Zúñi Mountains, New Mexico; *Ascodictyon northropi* Condra and Elias, 1944, a ctenostomatous bryozoan from the Pennsylvanian Magdalena group, State Penitentiary clay pit, Santa Fe, New Mexico; *Desmograptus northropi* Ruedemann, 1947, a graptolite from the Ordovician Mictaw series, Middle Port Daniel River, Gaspé, Quebec; and *Podocarpus northropi* Anderson, 1960, a coniferous pollen from the uppermost Cretaceous or lowermost Paleocene Ojo Alamo sandstone, Cuba, New Mexico.

# New Mexico's Fossil Record

BY  
STUART A. NORTHROP



THE UNIVERSITY OF NEW MEXICO  
EIGHTH ANNUAL RESEARCH LECTURE  
APRIL 7, 1961

This review of New Mexico's life of the past is dedicated to all those amateur and professional collectors, both young and old, who since 1841 have been filling their knapsacks and kegs and boxes and crates, and loading their burros and wagons and model T's and jeeps.

"And some run up hill and down dale, knapping the chucky stanes to pieces wi' hammers like sae many road-makers gone daft. They say 'tis to see how the world was made."—Sir Walter Scott.

Stuart A. Northrop

## NEW MEXICO'S FOSSIL RECORD

### INTRODUCTION

*The Earth is a vast cemetery where the rocks are tombstones on which the buried dead have written their own epitaphs.—Louis Agassiz.*

This is a story about fossils in New Mexico, what they are and where they occur, how old they are, who found them and who studied them, how they were named, described, and illustrated, and especially what they reveal of the succession of plant and animal life in this state—in the ancient seas and on the ancient lands.

Paleobotany, dealing with fossil plants, and paleontology, dealing with fossil animals, are truly borderline sciences, overlapping the fields of geology and biology. Another related geologic science is stratigraphy, which deals with the stratified rocks together with the fossils contained in them. What are fossils good for? We may answer this question by replying that fossils are used in several ways. First, they are used in chronology, that is, in dating the rocks; many of them are guide or index fossils and by using them judiciously stratigraphic sequences can be correlated from one locality to another, from state to state, and even from continent to continent. Second, fossils are used in reconstructing past environments, whether dry land, fresh-water stream, lake, or swamp, or marine. Third, they serve as clues to climate, whether arid or humid, polar or temperate or tropical; they may serve to determine even the temperature of sea water. Fourth, in bulk, fossils make beds of coal, phosphate, limestone, marble, and chalk. In a sense they form oil and gas. Certain ore deposits have been formed by the organic matter of wood and bone attracting and precipitating iron, copper, uranium, and other minerals. Agatized and opalized wood and bone have found extensive use as precious stones. All of these items are of immense practical and economic

significance. Our modern civilization has in large measure been founded on them, along with iron and other metals.

Fifth, fossils are also significant in and for themselves—they are the documents of the evolution of life on this planet. This might be regarded as the ivory-tower aspect of fossils in contrast to the practical, applied aspects. More than a century ago James Dwight Dana, that versatile mineralogist and geologist, wrote: "Geology is not simply the science of rocks, for rocks are but incidents in the earth's history. . . . It has a more exalted end—even the study of the progress of life from its earliest dawn to the appearance of man; and instead of saying that fossils are of use to determine rocks, we should rather say that the rocks are of use for the display of the succession of fossils."

Few states can boast of a more complete representation of the geologic column than New Mexico. Every period of the geologic time table is represented somewhere in the state by rocks containing fossils. During the past century the rocks of New Mexico have yielded a considerable array of fossils—more than 3,300 species of plants, invertebrates, and vertebrates, extending back over a span of 500 million years. More than 100 new genera and approximately 700 new species have been founded on New Mexico type specimens.

The late Paleozoic and Mesozoic rocks of northern New Mexico form some of the most spectacular scenery to be found in the Southwest. In describing the Jurassic sandstones of the great Red Wall between Bluewater and Gallup, Dutton (1885)\* remarked that out of them "have been carved the most striking and typical features of those marvelous plateau landscapes which will be subjects of wonder and delight to all coming generations of men." Colbert (1950) wrote of the valley of the Chama River: "Here is a land of vivid colors and towering cliffs, where every hour of the day and every change in the weather lend new aspects to the scene. It is a land doubly interesting to the paleontologist, because in addition to sweeping vistas there are excellent fossils to be found in this colorful cliff country."

Referring to the entire San Juan Basin of northwestern New Mexico, an area of 11,000 square miles in which strata have been warped into the shape of a shallow bowl with a diameter of about 120 miles, the eminent paleontologist George G. Simpson (1948) wrote: "Many of these formations are richly fossiliferous and the basin as a whole is one of the most interesting geological regions in the world and contains numerous thrilling chapters of the history of the earth and of life."

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\*In an article of this type, it is not feasible to document completely, for this would require a lengthy bibliography. The interested reader is referred to the several bibliographies cited in Selected References.

## GEOLOGIC TIME AND THE ROCK RECORD

### RELATIVE AND ABSOLUTE TIME SCALES

Before considering the fossil record we should examine the rock record, for it is in the stratified rocks that our fossils occur. The rocks of the Earth's crust can be fitted into a geologic time chart or table. This is a chronologically arranged table, subdivided into major units called eras, subdivisions of these called periods, and smaller units called epochs. "Period" and "epoch" are time terms; the rocks deposited during an epoch of time are designated a "series" and the rocks deposited during a period of time constitute a "system." By observing the relative order of succession or superposition of strata at any given exposure or outcrop and by correlating from one locality to another, the geologic time table was gradually evolved. Until 1907 there seemed to be little possibility of determining absolute ages in millions of years for critical points in the relative time table. Following the accidental discovery of radioactivity by the French chemist, Becquerel, in 1896, it was suggested in 1907 by the Yale chemist, Boltwood, that the ratio of lead to uranium in a mineral might be used to determine its age in millions of years. During the next two decades hundreds of minerals and rocks were analyzed, so that by 1930 the Earth's oldest rock was known to be about 1,850 million years old. In later years other methods of dating were devised: the lead/alpha-particle ratio, the potassium/argon ratio, and the rubidium/strontium ratio. The oldest rocks are now believed to be at least 3,600 million years old.

The accompanying tables give various estimates of critical points in the absolute time scale, first for eras and then for periods and some epochs. The last column in each table represents my thinking at the present time. It should be emphasized that nothing is likely to upset the placement of rocks and fossils in the relative time scale. However, the absolute time determinations are subject to revision and refinement.



**COMPARISON OF VARIOUS ESTIMATES OF CRITICAL POINTS  
IN THE GEOLOGIC TIME SCALE (IN MILLIONS OF YEARS)**

<i>Beginning of Era</i> (millions of years ago)	<i>Holmes</i> (1933)	<i>Dunbar</i> (1949)	<i>Colbert</i> (1955)	<i>U.S.G.S.</i> (1956)	<i>U.S.G.S.</i> (1958)	<i>Moore</i> (1958)	<i>Stirton</i> (1959)
<b>CENOZOIC</b>	60	71	70	60±2	65?	60	75
<b>MESOZOIC</b>	190	201	200	185±5	180	185	200
<b>PALEOZOIC</b>	510	501	520	520±10	510	520	520
<b>PRECAMBRIAN</b> (oldest rocks)	?	2,300+	?	3,250+	3,000+	3,500+	3,600+
<i>(Continued)</i>							
<i>Beginning of Era</i> (millions of years ago)	<i>Dunbar</i> (1960)	<i>Easton</i> (1960)	<i>Stokes</i> (1960)	<i>Northrop (1960</i> unpublished)	<i>Holmes</i> (1960)	<i>Kulp</i> (1961)	<i>Northrop (1962</i> this paper)
<b>CENOZOIC</b>	70	71	60	75±5	70±2	63±2	70±5
<b>MESOZOIC</b>	200	180	185	200±10	225±5	230±10	215±10
<b>PALEOZOIC</b>	500	486	520	510±20	600±20	590±20	550±25
<b>PRECAMBRIAN</b> (oldest rocks)	3,000+	?	3,300+	3,500+	?	?	3,600+

GEOLOGIC TIME SCALE, WITH ESTIMATES OF DURATION OF PERIODS AND EPOCHS. FIGURES NOT IN PARENTHESES—DURATION OF INTERVAL IN MILLIONS OF YEARS. FIGURES IN PARENTHESES—MILLIONS OF YEARS AGO.

Era	Period	Epoch	Northrop (1960, un- published)	Holmes (1960)	Kulp (1961)	Northrop (1962, this paper)
CENOZOIC	Quaternary	Recent	1	1	1	1
		Pleistocene	(1)	(1)	(1)	(1)
	Tertiary	Pliocene	11	10	12	9
			(12)	(11)	(13)	(10)
		Miocene	16	14	12	15
			(28)	(25)	(25)	(25)
		Oligocene	10	15	11	10
			(38)	(40)	(36)	(35)
		Eocene	20	20	22	20
			(58)	(60)	(58)	(55)
		Paleocene	17	10	5	15
MESOZOIC	Cretaceous		(75±5)	(70±2)	(63±2)	(70±5)
			55	65	72	65
	Jurassic		(130)	(135±5)	(135)	(135)
			35	45	46	40
	Triassic		(165)	(180±5)	(181)	(175)
			35	45	49	40
	Permian		(200±10)	(225±5)	(230±10)	(215±10)
			35	45	50	50
	Pennsylvanian		(235)	(270±5)	(280)	(265)
			35	40	40	55
PALEOZOIC	Mississippian		(270)	(310±5)	(320)	(320)
			35	40	25	25
	Devonian		(305)	(350±10)	(345)	(345)
			40	50	60	50
	Silurian		(345)	(400±10)	(405)	(395)
			35	40	20	25
	Ordovician		(380)	(440±10)	(425)	(420)
			60	60	75	60
	Cambrian		(440)	(500±15)	(500±10)	(480)
			70	100	90±10	70
PRECAMBRIAN	(oldest rocks)		(510±20)	(600±20)	(590±20)	(550±25)
			(3,500+)	(?)	(?)	(3,600+)

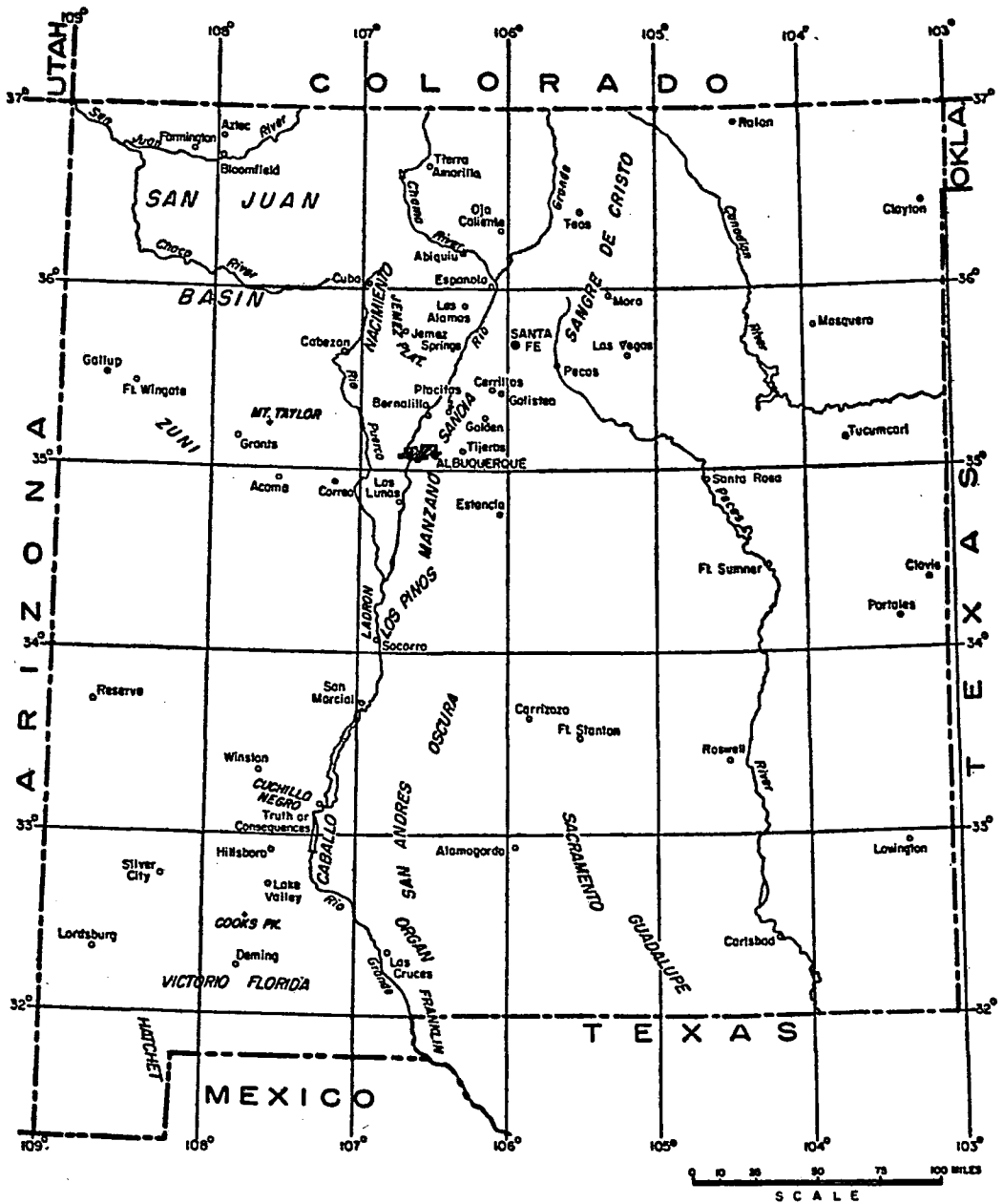


FIGURE 1  
INDEX MAP OF NEW MEXICO  
(Drafted by Diana H. Baltz, 1962)

## PHYSICAL HISTORY AND ROCKS

## Introduction

New Mexico, the fifth largest state, has an area of 121,666 square miles, extending north-south for about 5 degrees in latitude (about 390 miles) and east-west for about 6 degrees in longitude (about 350 miles). Elevations range from a minimum of 2,840 feet on the Pecos River southeast of Carlsbad to a maximum of 13,151 feet at Wheeler Peak northeast of Taos. The total relief is thus 10,311 feet. The state has a marked north-south grain, determined by regional structure and geomorphology. In the steep escarpments of many fault-block mountain ranges, the truncated edges of fossiliferous rock strata are well exposed.

The table below gives the percentage of New Mexico's area occupied by exposures of rocks belonging to each era and system, as estimated by Talmage and Wootton (1937).

Era	Percent	System	Percent
CENOZOIC	61	Quaternary	31
		Tertiary	30
MESOZOIC	19	Cretaceous	9.5
		Jurassic	1
		Triassic	8.5
PALEOZOIC	17	Permian	13
		Pennsylvanian	3.5
		Mississippian	0.5
		Devonian	
		Silurian	
		Ordovician	
		Cambrian	
PRECAMBRIAN	3		
Total	100		

*Precambrian Era (3,600+ to 550 million years ago)*

Exposures of Precambrian rocks amount to about 3 percent (or 3,650 square miles) of the area of the state. The rocks are metamorphosed sedimentary rocks and metamorphosed volcanic rocks, including gneisses, schists, phyllites, quartzites, greenstones, etc. Igneous rocks such as granite, porphyritic granite, syenite, diorite, gabbro, diabase, aplite, pegmatite, etc. have been intruded in the form of batholiths, stocks, and dikes. These rocks are exposed today in the cores of mountain ranges all the way from the Colorado line on the north to the Texas line on the south and from the Zuni Mountains and Silver City area on the west to a line extending from

the Sangre de Cristo Mountains to the Franklin Mountains on the east. (See Figure 1 for an index map.) However, because no fossils have been found in these ancient rocks in New Mexico, they will not be described in detail.

Few reliable age determinations have been made for the New Mexico Precambrian. Several rocks, such as the Sandia granite near Albuquerque, the Harding mine pegmatite between Santa Fe and Taos, and the Pidlite mine pegmatite between Pecos and Mora have been found to be 1,300 to 1,350 million years old. The sedimentary rocks intruded by these igneous rocks are obviously much older. In Figure 2 the Sandia granite would fall about 13 inches below the bottom of the chart and the Earth's oldest rocks about 4 feet below the bottom.

### *Paleozoic Era (550 to 215 million years ago)*

New Mexico has a better display of Paleozoic rocks than many other states. During the early part of this era the state occupied geographically a strategic position, southern New Mexico having been part of the Sonora or Ouachita trough, lying between a positive land mass on the north and a borderland on the south. During the Mississippian period parts of northern New Mexico, as well as southern New Mexico, were submerged and during the Pennsylvanian period most of the state was covered by marine waters. Every Paleozoic system from Cambrian to Permian is represented in New Mexico although there are impressive unconformities and disconformities and probably many hiatuses throughout the record. (See Figure 2, column headed "Environment of Deposition.")

Exposures of lower Paleozoic strata, including Cambrian, Ordovician, Silurian, and Devonian, are restricted chiefly to the southern part of the state, south of latitude 33° 35' or a line running approximately through Reserve, San Marcial, and Carrizozo. In northern New Mexico, Mississippian and Pennsylvanian (and, in places, Permian) strata are found lying unconformably on the Precambrian basement rocks.

*Cambrian Period (550 to 480 million years ago).* All Cambrian strata of New Mexico that crop out at the surface are believed to be of Late Cambrian age, no strata of Early or Middle Cambrian age having been recognized. Thus our record of Cambrian rocks and fossils began about 500 million years ago (see Figure 2). Outcrops of Upper Cambrian rocks are restricted to the southern third of the state, south of a line from Reserve through San Marcial to Carrizozo. The name Bliss formation is applied to these rocks, which are found today in narrow strips along escarpments of the Organ, San Andres, Caballo, Oscura, and Sacramento Mountains, and in scattered exposures near Winston and Silver City. The rocks are marine and include quartzite, sandstone, conglomerate, siltstone, shale, oolitic hematite (iron ore), etc.

Prevailing colors are dark brown to red, but some shales are gray or green. Thickness is generally less than 200 feet. Parts of the Bliss formation are of Late Cambrian and parts are of Early Ordovician age. The fossils are described later in this paper.

The accompanying chart (Figure 2) is an attempt to plot the relative geologic time scale, the absolute time scale in millions of years, and both environment of deposition and thickness of stratified rock in New Mexico since the end of Precambrian time. Starting at the left is a column designating eras; next is one showing periods with Tertiary subdivided into epochs (there is not enough space to show the breakdown of the Quaternary into Pleistocene and Recent). Next is the absolute time scale with units of 10 million years each. Adjoining this is a column depicting in a highly generalized way the environment of deposition of the sediments (whether marine, evaporite, or continental) and the occurrence of volcanic rocks. Blank spaces in this column represent hiatuses—times of non-deposition. Certain blocks are patterned only part way across the column; in the Ordovician, Silurian, and Devonian this indicates development in the subsurface of southeastern New Mexico. Again, the upper part of the Permian is represented only in southeastern New Mexico. The Cretaceous has three blocks, the one to the right for the northeastern corner, the one to the left for the northwestern corner, and the one in the middle for volcanic rocks in several areas. The Cenozoic part of the column is still more complicated.

Next is a rock scale showing thickness of rock, with each unit equal to 2,000 feet, and a column showing the theoretical composite column for the entire state obtained by combining the maximum thickness of each system; this totals more than 75,000 feet. The last four columns show the theoretical composite section for each quarter of the state.

**Ordovician Period** (480 to 420 million years ago). Each of the three epochs of the period is represented. The original classification for south-central New Mexico by Richardson (1904, 1909) was:

Upper Ordovician: Montoya limestone

Lower Ordovician: El Paso limestone

Later, the Middle Ordovician Simpson group, subdivided into five formations, was recognized in the subsurface of southeastern New Mexico, penetrated only by deep wells. (The top of this group is encountered at depths ranging from 7,290 to 11,990 feet below the surface.)

Then in 1952 Vincent C. Kelley and Caswell Silver elevated the Montoya and El Paso formations in the Caballo Mountains to group status and proposed that the El Paso group be subdivided into two formations and the Montoya group into four formations, as follows:

Upper Ordovician:	Montoya group	{ Cutter formation Aleman formation Upham dolomite Cable Canyon sandstone
Middle Ordovician:	Simpson group	(in subsurface)
Lower Ordovician:	El Paso group	{ Bat Cave formation Sierrite limestone

Finally, Rousseau H. Flower (1956, 1957, 1961) suggested that the Cable Canyon and Upham may be of Middle Ordovician age, giving the following classification for south-central and southwestern New Mexico:

Upper Ordovician	{ Cutter formation Aleman formation
Middle Ordovician	{ Upham dolomite Cable Canyon ss.
Lower Ordovician	{ Bat Cave formation Sierrite limestone

All exposed Ordovician strata are marine and restricted to the southern third of the state; most of northern New Mexico was apparently dry land. Outcrops for the most part are long narrow belts or strips, generally along the steep north-trending mountain escarpments. The rocks are mostly limestone, magnesian limestone, and dolomite, often cherty and white to light gray to dark gray in color; some beds weather brownish gray. Thickness of the outcropping edges of these rocks is several hundred feet for the Lower Ordovician, only about a hundred feet for the Middle Ordovician, and a few hundred feet for the Upper Ordovician. In the subsurface of southeastern New Mexico the Middle Ordovician thickens to about 1,000 feet. The northernmost outcrops are near the north end of the San Andres Mountains and the south end of the Oscura Mountains. Outcrops are found in the Sacramento, Organ, Franklin, Caballo, Cuchillo Negro, Cooks, Florida, Victorio, Hatchet, and other ranges of southwestern New Mexico.

**Silurian Period** (420 to 395 million years ago). The Silurian system is less well known than any other of the Paleozoic except the Cambrian, chiefly because of the scarcity of diagnostic fossils. Until recently the only epoch believed to be represented was the Middle Silurian and all exposed strata were referred to the Fusselman limestone or dolomite. In 1953, fossils found by L. C. Pray in the Fusselman of the Sacramento Mountains were interpreted by A. L. Bowsher as being of Early Silurian age.

All known Silurian rocks, both at the surface and in the subsurface, are marine and restricted to the southern part of the state. Although originally named the Fusselman limestone, the rock in many places is a dolomite or magnesian limestone, containing locally much chert and jasper. It is dark gray to brownish gray in color and a ledge- or cliff-former. At most outcrops in the ranges of southern New Mexico the thickness rarely exceeds 100 feet but in the Florida Mountains near Deming as much as 1,000 feet or more may be present.

*Devonian Period* (395 to 345 million years ago). As in the case of the preceding Paleozoic systems, practically all known Devonian strata are marine and restricted to the southern third of New Mexico, south of a line passing through Reserve, Carrizozo, and Roswell. Until 1935 only one Devonian formation had been recognized in the state—the Upper Devonian Percha shale. In 1941 an older unit—the Sly Gap formation—was established. Several other units have been named but these are thin and have limited distribution and most of our Devonian fossils have come from either the Upper Devonian Sly Gap or Percha. Only a few fossils of Middle Devonian age have been recognized.

The Sly Gap has a maximum thickness of 147 feet, consists of thin-bedded alternating siltstone, shale, and limestone, and is highly fossiliferous. The Percha ranges up to 428 feet in thickness, consists of black, gray, green, and yellow shale, with limestone nodules and lenses, and is also highly fossiliferous. The lithologic change from the Ordovician and Silurian limestones and dolomites to the Devonian shales is noteworthy.

In the Pecos-Taos-Mora-Las Vegas area of the Sangre de Cristo Mountains, Elmer H. Baltz, Jr., and Charles B. Read (1960) have named the Espiritu Santo formation and consider it to be of probable Devonian age. No determinable fossils have yet been found in this sandstone-limestone unit, which is generally less than 30 feet thick, but the possibility of its being of Late Devonian age is interesting because it suggests that marine waters may have spread across north-central New Mexico for the first time in more than 200 million years.

*Mississippian Period* (345 to 320 million years ago). For many years the only Mississippian formation recognized in New Mexico was the Lower Mississippian Lake Valley formation, named in 1882 for the silver mining district south of Hillsboro. In subsequent years many additional formation names have been proposed and these rocks range in age from Early to Late Mississippian. The Kelly formation was named in 1904 by C. L. Herrick, president of the University of New Mexico, for the Kelly mine in the Magdalena mining district west of Socorro. The Caloso formation of the Ladron Mountains was named by E. A. Noble (1950) in his master's thesis, and the Arroyo



Peñasco formation was discovered in the Nacimiento Mountains west of Jemez Pueblo in 1951 by an undergraduate student, A. K. Armstrong.

Outcrops of Mississippian rocks are found chiefly south of a line from Reserve through San Marcial and Carrizozo to the Sacramento Mountains east of Alamogordo. Small scattered exposures are found near Socorro, Ladron Peak, and in the Sandia, Nacimiento, and Sangre de Cristo Mountains in central and north-central New Mexico.

The Caballero formation is known only in a small area of south-central New Mexico, with outcrops in the Sacramento and San Andres Mountains. This unit, ranging from zero to 75 feet in thickness, consists of gray silty nodular limestone and shale. The most widespread and most fossiliferous formation is the Lake Valley, consisting of thin-bedded gray to massive black, very cherty limestone, soft marls, and siltstones, generally 200-300 feet thick; the maximum thickness reported is 449 feet. Locally this formation has been subdivided into six named members. A striking and characteristic feature is the mounds (bioherms or reefs), composed chiefly of crinoid and other fossil debris, that range from a few feet to a mile in diameter and rise to heights of 200 feet above the base.

The Caballero and Lake Valley, as well as Kelly, Caloso, and related formations are of Early Mississippian age. The Arroyo Peñasco formation has yielded a fauna from meager exposures in the Nacimiento Mountains that indicates a Middle Mississippian age. In southern New Mexico the Las Cruces and Rancheria formations have yielded small faunas suggesting a similar age. The Helms formation, restricted to southern New Mexico, contains a few fossils indicating a Late Mississippian age. All of these Mississippian rocks mentioned so far, as well as the underlying Devonian, Silurian, Ordovician, and Cambrian rocks, appear to be marine deposits. At the top of the Mississippian Paradise formation in the Hatchet Mountains, R. A. Zeller, Jr., reports a continental sandstone containing fossil land plants. Some geologists, however, believe that this sandstone is of Early Pennsylvanian age.

**Pennsylvanian Period** (320 to 265 million years ago). Outcrops of Pennsylvanian rocks cover about  $3\frac{1}{2}$  percent (4,260 square miles) of New Mexico. This may be compared, on the one hand, with  $\frac{1}{2}$  of 1 percent occupied by outcrops of all underlying Paleozoic systems and, on the other hand, with 13 percent occupied by the overlying Permian system. These Pennsylvanian outcrops range across the state from the Colorado line to the Texas line in the central part. During the period much of New Mexico was under water in the most extensive Paleozoic submergence known, exceeded only by the Upper Cretaceous flood. More of northern New Mexico was submerged beneath the seas than in earlier Paleozoic time.

The Pennsylvanian system is much thicker than any of the preceding Paleozoic systems, ranging to more than 8,000 feet in the Sangre de Cristo

Mountains (C. B. Read and G. H. Wood, Jr., 1947). The environment of deposition changes from nonmarine to marine and then back to nonmarine. The rocks are chiefly limestone, with interbedded sandstone, siltstone, shale, and local arkose, conglomerate, and gypsum; some of the limestone beds are quite cherty. Colors change from rusty yellow and brown at the base to white and gray in the middle to reds and grays at the top. The entire Pennsylvanian sequence is known as the Magdalena group, which in northern New Mexico is subdivided into the Sandia formation below and Madera limestone above. The Sandia formation consists of dark brown, brownish gray, brownish green, and yellow conglomerate, sandstone, and sandy limestone, with local carbonaceous shale and a few thin noncommercial coal beds. The Madera limestone consists of a dark gray cherty limestone member interbedded with gray shale and a few sandstone beds and an overlying arkosic limestone member of gray to white limestone and gray, green, maroon, and red shale, siltstone, and arkose.

As seen so clearly from Albuquerque, the stripes just below the crest of the Sandia Mountains are made by several hundred feet of Pennsylvanian limestone, shale, and sandstone resting on the Precambrian basement. The contact is a profound unconformity—a lost interval of time; missing between the Precambrian and Pennsylvanian are the Cambrian, Ordovician, Silurian, Devonian, and Mississippian systems. It is a stirring thought to contemplate the sea shells, shark teeth, and other fossils embedded in the rocks of the Sandia Crest, today standing more than 10,600 feet above sea level, and reflect upon how different the geography of that distant day was—possibly 300 million years ago—when these animals were living in an ancient sea! We are reminded of Tennyson's stanzas:

There rolls the deep where grew the tree.  
O earth what changes hast thou seen!  
There where the long street roars, hath been  
The stillness of the central sea.

The hills are shadows, and they flow  
From form to form and nothing stands;  
They melt like mists, the solid lands,  
Like clouds they shape themselves and go.

In 1942 M. L. Thompson proposed for the Pennsylvanian strata of south-central New Mexico an elaborate classification, naming 4 series, 8 groups, and 16 formations. Good collecting localities abound in many of the state's mountain ranges, from the Sacramento, San Andres, Organ, and Franklin Mountains in the south through the Caballo, Oscura, and Los Pinos in the center to the Manzano-Sandia, Nacimiento-Jemez, and Sangre de Cristo Mountains in the north. Several masters' theses and doctoral dissertations have been devoted to the Pennsylvanian rocks and fossils of New Mexico.

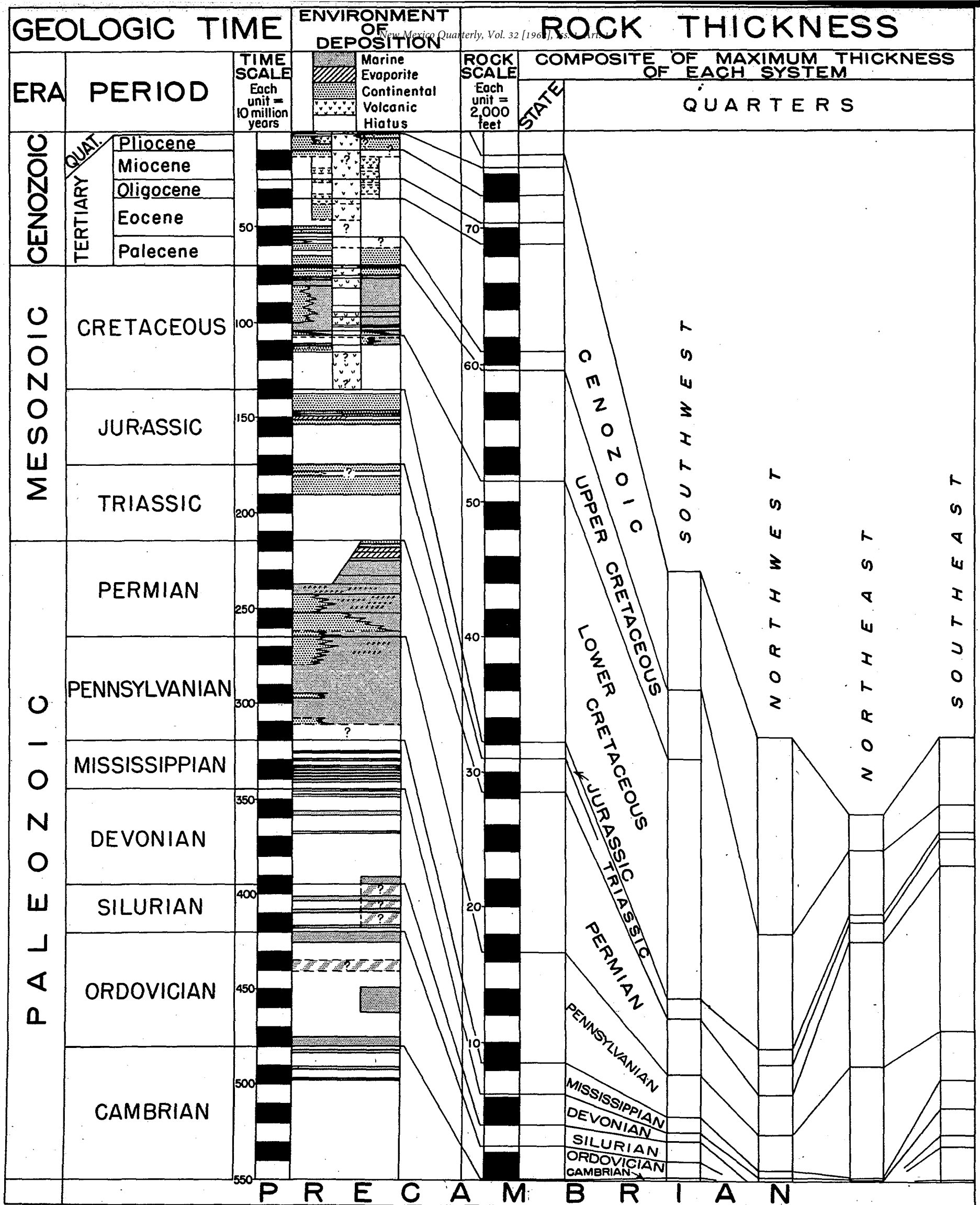


FIGURE 2

CHART SHOWING RELATIVE AND ABSOLUTE GEOLOGIC TIME SCALES, GENERALIZED ENVIRONMENT OF DEPOSITION IN NEW MEXICO, AND MAXIMUM ROCK THICKNESS OF EACH SYSTEM WITH ONE COLUMN FOR THE THEORETICAL STATE COMPOSITE AND A COLUMN FOR EACH QUARTER OF THE STATE (THE COLUMN FOR THE SOUTHWEST QUARTER SHOULD BE SLIGHTLY HIGHER TO CORRESPOND WITH A THICKNESS OF 46,257 FEET). ORIGINAL CHART (12 FEET LONG IN COLORS) BY S. A. NORTROP, 1961; REDRAWN BY DIANA H. RAITZ, 1962.

*Permian Period* (265 to 215 million years ago). As already noted, Permian outcrops total 13 percent or nearly 16,000 square miles of New Mexico's area. The rocks range up to more than 12,000 feet in thickness in southeastern New Mexico and, along with West Texas, constitute the most complete and significant Permian sequence known in the United States.

In general, the Permian strata of southeastern New Mexico are dominantly marine; to the west, northwest, and north they are mixed marine and continental; in the northwestern and northern part they are dominantly continental. In central and northern New Mexico only the early part of Permian time is represented in a sequence 2,000 to 3,000 feet thick. The later part of Permian time is represented only in southeastern New Mexico. While it is true that locally the Pennsylvanian system contains thin lenses of gypsum, it is in the Permian that much greater thicknesses of anhydrite, gypsum, salt, and other evaporites are found. Near the top of the section in the subsurface of southeastern New Mexico the Ochoa group includes the great Castile anhydrite and the Salado salt and associated potash minerals.

At the base of the Permian, the Abo and equivalent formations provide dark red to chocolate-brown colors. At most outcrops in central and northern New Mexico the Abo is continental in origin; the arkosic sandstone, siltstone, and shale exhibit cross bedding, ripple marks, mud cracks, and casts of salt crystals; and the fossils present are plants and both bones and tracks of amphibians and reptiles. The rocks clearly represent river and swamp deposits. To the southeast the Abo red beds interfinger with marine limestones. The overlying Yeso formation consists of sandstone, siltstone, shale, anhydrite, gypsum, and limestone. In central and northern New Mexico the Yeso presents such colors as salmon-pink, orange-red, geranium-red, coral-red, dark red, and scarlet; to the southeast the Yeso becomes marine and shows an increase in limestone. The overlying Glorieta sandstone is white to buff and yellow in color. The succeeding San Andres limestone is dark gray to black, medium to thick bedded, and contains relatively large fossils of various marine invertebrates. The San Andres completes the Permian sequence in northern and central New Mexico. In southeastern New Mexico the younger Guadalupe series is a thick marine sequence, predominantly limestone. Some beds are honeycombed by solution and there are many large caverns such as Carlsbad Caverns. Artesian water occurs in the Pecos Valley between Roswell and Carlsbad, and to the east oil and gas occur in these rocks. Overlying the Guadalupe series is the Ochoa series, which includes great thicknesses of salt, various potash salts, anhydrite, and gypsum—all deposited in the shrinking Late Permian sea as it made its last stand in southeastern New Mexico and adjoining Texas.

The Permian period brought the Paleozoic era to a close and although there was little mountain-making in New Mexico (as there was elsewhere in

the world), the entire state emerged from beneath the seas. This emergence lasted for perhaps 100 million years.

### *Mesozoic Era (215 to 70 million years ago)*

Mesozoic strata are thicker and are exposed over much larger areas in the northern half of the state than in the southern half. This, of course, affords a striking contrast with the Paleozoic strata. In some places Mesozoic strata were deposited in the southern part of the state, only to be removed by subsequent erosion. In other places certain Mesozoic strata never were deposited in southern New Mexico. Mesozoic exposures amount to 19 percent of the area of the state, compared with 17 percent for the Paleozoic and 3 percent for the Precambrian.

Triassic and Jurassic rocks are almost exclusively continental; Cretaceous rocks are predominantly marine, although thick continental deposits are interbedded in places. Triassic and Jurassic strata are brightly colored, while the overlying Cretaceous strata are mostly drab. Apparently the Upper Cretaceous sea covered all of New Mexico for the first and only time in its post-Precambrian history.

*Triassic Period (215 to 175 million years ago).* About 8½ percent (10,300 square miles) of New Mexico is occupied by exposures of Triassic rocks, chiefly Late Triassic in age (see Figure 2 for the hiatus of Early to Middle Triassic time). The Chinle formation of northwestern New Mexico and the Dockum group of northeastern New Mexico consist of several hundred to more than 2,000 feet of shale, siltstone, sandstone, and conglomerate, with local lenses of bentonite. Bentonite is altered volcanic ash and testifies to New Mexico's first volcanic activity for several hundred million years. The sites of these volcanoes have not been determined; they may well have been located in some adjoining state. The sandstones are white, buff, yellow, and brown, locally stained brown-black; the shales exhibit bright and variegated colors, such as red, poppy-red, scarlet, orange-red, terra cotta, chocolate-red, purple-red, maroon, purple, red-brown, lavender, green, and gray. These sediments were deposited by streams and lakes over a flat, low-lying country. Earlier workers had suggested a desert climate but today we believe that it was probably warm tropical to subtropical. We know that lush vegetation grew along the stream courses and that on the low uplands were forests of conifers.

In northwestern New Mexico north of the Zuni Mountains, the Wingate sandstone, as much as 300 feet of massive cross-bedded and in part wind-deposited sandstone, overlies the Chinle. Formerly assigned to the base of the Jurassic, this unit is now believed to be of latest Triassic age.

*Jurassic Period* (175 to 135 million years ago). Only about 1 percent of the area of New Mexico is occupied by outcrops of Jurassic rocks and these are restricted to the northern half of the state. Many names have been applied to minor stratigraphic units in the last decade (the proliferation of names accompanying the search for uranium ore), but essentially the Jurassic may be subdivided into three major units: 1) the Entrada sandstone below, 2) the Todilto limestone and gypsum in the middle, and 3) the Morrison formation above. These are well displayed in the prominent cliffs locally called the Red Wall north of U. S. Highway 66 and the Santa Fe Railroad from the vicinity of Grants and Bluewater through Thoreau and Fort Wingate nearly to Gallup.\*

The Entrada is a massive, extensively cross-bedded sandstone 100-200 feet thick. Colors range from pink and red below to buff, yellowish, tan, light gray, and white above. It was deposited by streams and the wind. The overlying Todilto is a dark gray to brown, thin- and platy-bedded fetid limestone, a foot or two to 20 feet in thickness. (German geologists call such a rock "stinkstein" and years ago Americans used the term "stinkstone." When struck with a pick, the rock emits  $H_2S$  and the odor is that of a rotten egg.) At many localities in northern New Mexico the limestone is overlain by a bed of pure white gypsum locally more than 100 feet thick. Some geologists believe that the Todilto is a lake deposit whereas others believe that it is marine. The paper-thin laminations of the Todilto are actually varves or annual in origin; Roger Y. Anderson and Douglas W. Kirkland (1960) found that the 10-13-year sunspot cycle and also the 60-, 85-, 170-, and 180-year cycles were recorded in the varved sequence. They estimate that it took about 14,000 years for the limestone to be deposited and about 6,000 years for the gypsum. Contrast this with the span of 40 million years for the period.

The Morrison formation, a few hundred to 800-900 feet thick, consists of variegated shale and sandstone, mudstone, claystone, and siltstone. The sandstones exhibit such colors as tan, brown, gray, buff, yellow, yellowish gray, and greenish buff, while the shales are chocolate-brown, pink, purple, maroon, lavender, light gray, and malachite-green; locally there are beds of salmon-pink to scarlet "chert." The Morrison was deposited in rivers and lakes upon an extensive poorly drained plain. In Montana, Wyoming, Colorado, and Utah this formation has yielded many fossils of plants and both invertebrate and vertebrate animals, including a host of large dinosaurs and small primitive mammals. Practically no fossils had been found in the New Mexico Morrison until a few years ago.

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\*In this area Clay T. Smith (1954) has named the Thoreau formation, consisting of 300-400 feet of siltstone and cross-bedded sandstone, between the Todilto and the 500-foot Morrison formation.

**Cretaceous Period** (135 to 70 million years ago). Cretaceous outcrops occupy  $9\frac{1}{2}$  percent or more than 11,500 square miles of New Mexico. The system is commonly divided into two parts, Lower and Upper. The Lower Cretaceous is thickest in southwestern New Mexico and thin elsewhere in the state; the total outcrop area is small. The Upper Cretaceous, on the other hand, is extensively exposed over the northern half of the state and the outcrop area is relatively large. From much of the southern half the Upper Cretaceous rocks have been removed by erosion. New Mexico was highly unstable during Cretaceous time, as shown by fluctuating shorelines, transgressive and regressive overlaps, and alternations of continental stream, swamp, and lagoon deposits with marine and delta deposits. Toward the end of the period the Laramide Revolution began and New Mexico emerged for the last time from beneath the seas, marking the end of the Mesozoic era and ushering in the Cenozoic era.

In the southwestern corner of the state, notably in the Little Hatchet Mountains, the Lower Cretaceous Bisbee group has a thickness of about 19,000 feet. If the maximum thicknesses of the seven formations proposed by Lasky (1938 and subsequent papers) be added together, the theoretical composite maximum totals more than 26,000 feet. Actual thickness probably ranges from 17,000 to 21,000 feet, the thickest part of some formations overlying or underlying the thinnest part of others; maximum thickness at any one place may be conservatively taken as 19,000 feet. Marine and fresh-water sediments are interbedded with volcanic rocks such as basaltic lava flows. A generalized summary of the changing environments recorded in the Little Hatchet Mountains by the 19,000-foot Bisbee group is as follows:

- |          |                                      |
|----------|--------------------------------------|
| (top)    | continental fresh-water and volcanic |
|          | marine                               |
|          | continental fresh-water              |
|          | marine                               |
|          | volcanic                             |
|          | marine                               |
|          | volcanic                             |
|          | continental fresh-water and volcanic |
| (bottom) | marine                               |

Some gypsum occurs at the top of Zeller's Hell-to-Finish formation in the Big Hatchet Mountains. Elsewhere in the state are scattered outcrops of relatively thin sections of both marine and nonmarine strata: shale, sandy clay, marl, sandy marl, sandstone, and limestone.

A few thousand feet of Upper Cretaceous rocks occur in northeastern New Mexico, while 7,000 feet or more occur in northwestern New Mexico. In a general way the sequence in northeastern New Mexico begins with non-marine sandstone and conglomerate, passes upward through marine shale

with thin limestone, more shale, chalky shale, marl, and thick shale, and terminates with a thick mantle of nonmarine sandstone containing relatively thick coal beds. In northwestern New Mexico the sequence is similar but marine and continental sandstones are introduced earlier and near the top the Fruitland and Kirtland nonmarine units include much shale. Coal, oil, and gas are important economic resources in this corner of the state.

Because the Upper Cretaceous sequences are so thick, they have been subdivided into a rather large number of stratigraphic units. For example, the following skeleton classifications are used in northern New Mexico.

Northwestern	Northeastern
(top) Ojo Alamo sandstone	(top) Basal part of Raton fm.
Kirtland shale	Vermejo fm.
Fruitland formation	Trinidad sandstone
Pictured Cliffs ss.	
Lewis shale	Pierre shale
Mesaverde group:	
Cliff House—Chacra ss.	
Menefee fm.—Allison barren member—La Ventana ss.	
Gibson coal m.—Hosta ss.	Niobrara formation:
Satan shale tongue	
Bartlett barren m.—	Smoky Hill marl member
Dalton ss.	
Mulatto shale tongue	Fort Hays limestone m.
Dilco coal member	
Gallup ss. member	Carlile shale
Mancos shale with	Greenhorn limestone
Tres Hermanos ss.	Graneros shale
(bottom) Dakota sandstone	(bottom) Dakota sandstone

There was considerable volcanic activity in southwestern New Mexico during Cretaceous time. The Upper Cretaceous seas provide us with our last record in New Mexico of marine life. With the continental emergence before the close of the Cretaceous, approximately 75-80 million years ago, the seas retreated and New Mexico has been high and dry since that time.

#### *Cenozoic Era (70 million years ago to present)*

The Cenozoic era is commonly subdivided into two periods, each with several epochs, as follows.

Quaternary	{	Recent Pleistocene
Tertiary	{	Pliocene Miocene Oligocene Eocene Paleocene



These rocks are all continental or terrestrial sediments and igneous intrusive and extrusive rocks. They occupy 61 percent or 74,000 square miles of the surface of New Mexico. Tertiary exposures amount to 30 percent (about 36,500 square miles) and Quaternary exposures amount to 31 percent. In a rough way, the Tertiary's 30 percent is composed of 19 percent sediments and 11 percent igneous, chiefly volcanic, rocks. The Quaternary's 31 percent is composed of 27 percent sediments and 4 percent igneous, chiefly volcanic, rocks.

Cenozoic time was marked in New Mexico as elsewhere in the Western Interior by mountain-making, intrusive and extrusive igneous activity, tremendous erosion, and extensive deposition of sediments on flood plains and in basins and lakes. Early Tertiary time witnessed extensive accumulation of continental sediments in northwestern New Mexico, great volcanic activity in the southwestern quarter, and active erosion elsewhere. Outcrops of Paleocene and Eocene sediments amount to about 6 percent of the state's area. Later Tertiary time witnessed accumulation of thick deposits in basins along the Rio Grande and a widespread sheet of sand and gravel over much of the eastern third of the state. Little is known of Oligocene time, but outcrops of the Miocene and Pliocene sediments amount to about 13 percent of the state's area. During the Pleistocene there was erosion, sedimentation, and volcanic activity, and glaciation occurred at higher elevations in the north-central part of the state.

Schuchert has remarked, of the continental deposits of the entire Rocky Mountain region, that "the thickness at any one place varies from a few hundred feet to several thousand, but if all the thickest local deposits are combined the total Cenozoic sedimentation attains to well over 20,000 feet. It is in this vast mass of material that lies buried the most interesting known record of mammalian evolution, the remains of one organic dynasty after another, whose histories have attracted the attention of paleontologists the world over."

*Paleocene Epoch* (70 to 55 million years ago). During the Paleocene epoch, extensive swamps covered the Raton region as they had during the Late Cretaceous and in the Raton formation a profusion of fossil plants is preserved. In the San Juan Basin the Nacimiento formation (formerly the Puerco and Torrejon formations) represents floodplain deposits of banded unctuous clays and sandy clays of variegated colors, such as gray to black and yellow with an occasional red bed, and buff, gray, and white sandstones. Many fossil animals and some plants have been collected from these strata.

*Eocene Epoch* (55 to 35 million years ago). During this epoch as much as 2,000 feet of sediment—the San Jose formation (formerly called the Wasatch)—accumulated in the San Juan Basin. These fossiliferous fluvial sedi-

ments include intergrading facies of 1) cross-bedded sandstones and conglomerates with thin clay and silt beds; 2) banded and variegated clays and silts of pale pastel shades (such as pale yellow, lavender, violet, purple, red, bluish) with some sandstone; and 3) reddish to bright red clays and silts with lenses and splotches of pale bluish or greenish color. These are Simpson's (1948) Yegua, Almagre, and Largo facies of the San Jose formation.

The Galisteo formation, possibly 4,000 feet thick, which was deposited in the Cerrillos-Galisteo area, is characterized by a local abundance of large silicified logs—probably the first New Mexico fossils to attract widespread attention.

*Oligocene Epoch* (35 to 25 million years ago). During the Oligocene epoch erosion, sedimentation, and volcanism were undoubtedly going on in New Mexico but practically no fossil record has been recovered in the state. This seems to be the greatest lacuna in New Mexico's Cenozoic record. Without diagnostic fossils we cannot date the rocks with any assurance. With so many tectonic basins formed at different times between late Eocene and early Miocene time, it seems likely that fossiliferous Oligocene sediments would have been trapped somewhere within the state's borders. Whether such hypothetical deposits are today exposed at the surface is another matter.

*Miocene and Pliocene Epochs* (25 to 1 million years ago). Erosion, sedimentation, and volcanism continued through the Miocene and Pliocene epochs. The Santa Fe formation or group (originally the Santa Fe marl), consisting of several thousand feet of gravel, sand, silt, clay, marl, tuff, and interbedded lava flows, was deposited by streams and the wind as alluvial-fan, flood-plain, and lake deposits in several basins along the Rio Grande Valley all the way from Colorado to Texas. The sandstones and gravels are reddish buff, orange, yellowish white, and cream-colored; the silts and clays, often micaceous, are gray-green to red-brown, etc.; marls and tuffs are white and other light shades; interbedded lavas are dark gray to black. The sediments often weather and erode to produce badlands and picturesque bluffs; the tuff and agglomerates weather to pedestal rocks and hoodoos. From this formation in the Española basin an impressive array of fossil vertebrates, particularly mammals, has been collected.

Over the High Plains of eastern New Mexico the much thinner Ogallala formation was deposited. This unit is presumably equivalent in age to the Santa Fe but has yielded few diagnostic fossils.

*Pleistocene and Recent Epochs* (1 million years ago to present). Erosion, deposition, and volcanic activity continued. Sand, gravel, silt, and clay were deposited by streams and in lakes; volcanic ash or tuff (weathering to tent

rocks in places), dune sands, and lava flows are also characteristic; glacial deposits accumulated at higher elevations in north-central New Mexico. Volcanic activity continued in certain places until perhaps 1,000-2,000 years ago. Notable collections of fossils have been made from several caves.

Although fossils such as leaves and insects are sometimes found in volcanic ash deposited in lakes (such a matrix being essentially a sedimentary rather than a volcanic rock), they are rarely found in lava. However, in the recent McCartys flow, which extended down into the San Jose Valley south-east of Grants possibly a thousand years ago, a number of vertical tree molds ranging from 1 to 3 feet in diameter have been discovered. The lava bears clear impressions of the bark, presumably of pine trees that were either consumed by fire or simply decayed after the lava had congealed.

### THEORETICAL COMPOSITE SECTIONS

The year I came to New Mexico, 1928, a geologic report stated that the theoretical maximum thickness of stratified rocks in the state was 16,000 feet. Twenty-three years later McKee (1951) boosted this figure to 32,000 feet for the combined Paleozoic and Mesozoic rocks. Today the figure stands at more than 75,000 feet for Paleozoic, Mesozoic, and Cenozoic. This is a good example of inflation! Because formations are wedged shaped and inter-finger, such a great thickness is not found at any one place. In order to emphasize this fact, the following table giving maximum thickness by eras for each of the four quarters of the state was prepared.

Era	Southwest quarter (feet)	Northwest quarter (feet)	Northeast quarter (feet)	Southeast quarter (feet)
Cenozoic	9,000	14,550	2,650	5,000
Mesozoic	25,450	11,638	6,759	4,500
Paleozoic	11,807	6,250	17,372	22,886
Total	46,257	32,438	26,781	32,386

Thus we see that the theoretical maximum thickness of rock in the southwest quarter of the state is nearly 9 miles, contrasting with 6 miles for the northwest and southeast quarters and with 5 miles for the northeast quarter. It should be emphasized that such great thicknesses are not present in any one county or smaller area.

By taking the maximum thickness of each formation or other small stratigraphic unit wherever it occurs in the state, it is possible to compile a theoretical maximum composite section for each system and thus construct a state composite, as shown below.

## THEORETICAL COMPOSITE SECTION FOR NEW MEXICO BY SYSTEM AND ERA

System	Thickness (feet)	Era	Thickness (feet)
Quaternary	1,000	Cenozoic	16,050
Tertiary	15,050		
Upper Cretaceous	8,095	Mesozoic	30,888
Lower Cretaceous	19,250		
Jurassic	1,227		
Triassic	2,316		
Permian	12,085	Paleozoic	28,695
Pennsylvanian	8,000		
Mississippian	2,340		
Devonian	2,317		
Silurian	1,387		
Ordovician	2,380		
Cambrian	186		
Total	75,633	Total	75,633

Thus the theoretical composite section for the state totals 75,633 feet or more than 14 miles.

Despite these impressive thicknesses, there are important hiatuses in the record—long spans of time not represented by any deposits. On the other hand, it seems clear that certain thick sedimentary sequences were deposited in relatively short spans of time. For example, the deposition of 19,000 feet of Lower Cretaceous rock in southwestern New Mexico may have been accomplished in a mere million or so years.

## DERIVATION OF STRATIGRAPHIC NAMES

The names applied to rock units, such as groups, formations, members, tongues, and lentils, are generally derived from some geographic feature such as a mountain peak or range, river, town, county, ranch, etc. Some such names have been introduced into New Mexico from adjoining states, but most have originated within the state's boundaries. A number of New Mexico names are derived from the Spanish; a few are Indian in origin.

In their *Lexicon of New Mexico Geologic Names: Precambrian through Paleozoic*, Jicha and Lochman-Balk (1958) listed 368 names for these two eras alone. As they point out, quite a few of these names either have been or should be suppressed, but about 275 are still in good standing. In addition to these Precambrian and Paleozoic names, several hundred more names have been applied to Mesozoic and Cenozoic rock units.

A few examples of stratigraphic names and their derivations are given below, starting with native or indigenous names, that is, names first applied in New Mexico. The Sandia formation was named for the Sandia Mountains,

while the Madera limestone was named for the village (now abandoned) of La Madera on the east slope of the Sandias. Some years ago Gordon Wood and I named the San Ysidro and Meseta Blanca sandstone members of the Yeso formation, the former for the village of San Ysidro and the latter for a small mesa north of Jemez Pueblo. (The Yeso formation had been named in 1909 for Mesa del Yeso in Socorro County.) We also named the Agua Zarca sandstone member and Salitral shale tongue of the Chinle formation for creeks at the north end of the Jemez Mountains. (The name Chinle had been introduced from Arizona many years earlier.) Someone who shall be nameless proposed the term Bug Scuffle limestone member of the Gobbler formation for Bug Scuffle Hill, while the Gobbler was named for a triangulation station in the Sacramento Mountains. The Alamogordo member of the Lake Valley formation was named for the city, while the Lake Valley itself had earlier been named for the mining camp.

Other New Mexico names and their sources include:

Abo formation (canyon and pass)	La Ventana sandstone (hamlet and mesa)
Armendaris group (land grant)	Moya formation (spring)
Bar B formation (draw)	Nakaye formation (mountain)
Bartlett barren member (coal mine)	Nunn member (ranch)
Bat Cave formation	Ojo Alamo sandstone (spring and trading post)
Bishop's Cap member (peak)	Par Value member (mining claim)
Box member (the Box, on Percha Creek)	Percha shale (creek)
Broken Jug limestone (pass)	Playas Peak formation
Bruton formation (stock tank)	Puerco formation (river)
Caballero formation (canyon)	Ready Pay member (gulch)
Chacra sandstone (mesa)	Ringbone shale (ranch)
Cibola limestone (mill)	San Andres limestone (mountain range)
Corbett sandstone (ranch)	Satan shale tongue (pass)
Dalton sandstone (pass)	Sierrite limestone (iron mine)
Dona Ana member (county)	Skunk Ranch conglomerate
Elephant Butte formation	Sly Gap formation
Fletcher anhydrite member (potash test well)	Tansill formation (power dam)
Gallup sandstone member	Todilto formation (park)
Garcia formation (road)	Torrejon formation (arroyo)
Glorieta sandstone (mesa)	Upham dolomite (railroad station)
Hidalgo volcanics (county)	Vermejo formation (park)
Howells Ridge formation	Whiskey Canyon limestone
	Wingate sandstone (old fort)

Names introduced from Arizona into New Mexico include Bisbee group (mining town), Chinle formation (valley), Earp formation (hill named for an outlaw), and Epitaph dolomite (gulch). From Utah we have Aneth formation (town), San Rafael group (from San Rafael Swell, a topographic feature), Summerville formation (Summerville Point), and Salt Wash sandstone member.

A large number of names have been introduced from Colorado, among which are the following:

- Carlile shale (spring and station)
- Cliff House sandstone (cliff houses near Mesa Verde)
- Cutler formation (creek)
- Graneros shale (creek)
- Greenhorn limestone (station and creek)
- Menefee formation (mountain)
- Mesaverde group (Mesa Verde)
- Molas formation (lake)
- Morrison formation (town)
- Pinkerton Trail formation (trail)
- Sangre de Cristo formation (mountain range)

Names introduced from Oklahoma include Hunton group (ghost hamlet), Joins formation (ranch), Simpson group (former village), and Tulip Creek formation. Names from Kansas include Fort Hays limestone (old fort) and Smoky Hill marl (river).

Among the many names brought in from Texas are:

- Bliss formation (fort)
- Dockum group (town)
- El Paso limestone (city)
- Fusselman limestone (canyon)
- Getaway limestone member (gap)
- McKee sandstone member (oil well)
- Montoya limestone (station)
- Pinery limestone (stagecoach station on Butterfield Trail)
- Powwow conglomerate member (canyon)
- Tecovas formation (creek)
- Yates sandstone (oil pool)

Occasionally names are brought in from greater distances. Thus from Nebraska we have Dakota sandstone (town in northeastern Nebraska), Niobrara formation (river), and Ogallala formation (town). The Pierre shale was introduced from South Dakota (exact location of Fort Pierre not known today). The Benton group (named for a fort) was brought all the way from Montana.

As we shall see later, fossil plants and animals are sometimes named for the stratigraphic units from which they were obtained and thus generic and specific names may reflect a geographic name indirectly.

## LIFE OF NEW MEXICO — THE FOSSIL RECORD

## SYNOPSIS OF PLANTS AND ANIMALS

In the following synopses, the major divisions or phyla are arranged in order of increasing biologic complexity, from simplest to most highly organized.

## Synopsis of Plants

Except for the calcareous algae which for the most part are marine, remains of plants are generally found in continental deposits of rivers, lakes, and swamps. Logs are sometimes carried down by streams to the sea and thus incorporated in marine deposits.

**THALLOPHYTA.** Thallophytes: bacteria, diatoms, fungi, algae (seaweeds), etc. The most primitive plants. Some algae secrete lime, are commonly found fossil as banded limy masses (stromatolites), and are important rock-builders. Geologic range of these calcareous algae: Precambrian to Present. Locally abundant and conspicuous in marine Ordovician, Pennsylvanian, and Permian rocks of New Mexico.

**BRYOPHYTA.** Bryophytes: mosses and liverworts. Fossils are quite rare and apparently not yet reported from New Mexico.

**PSILOPSIDA.** Psilopsids: primitive, generally leafless plants. Probably the first plants to become adapted to life on the lands. Silurian to Present. Not yet reported from New Mexico but known in Devonian strata of Arizona.

**LYCOPSIDA.** Lycopsids: scale-trees, seal-trees, club-mosses, quillworts, etc. Some were trees more than 100 feet tall. Devonian to Present. *Lepidodendron* and *Sigillaria* are chiefly Mississippian, Pennsylvanian, and Permian in age.

**SPHENOPSIDA.** Sphenopsids: *Calamites* and *Equisetum*—the horsetail or scouring rushes. These plants have hollow, ribbed, and jointed stems and whorls of scale-like leaves (to which the generic name *Annularia* is applied). Devonian to Present. Common in Pennsylvanian, Permian, and Triassic.

**PTEROPSIDA.**

**FILICINEAE.** True ferns, reproducing by spores; some are of tree size. It is often difficult or even impossible to distinguish the true ferns from the extinct seed-ferns. Devonian to Present. Not uncommon in the Pennsylvanian.

**GYMNOSPERMAE.** Gymnosperms or naked-seed plants.

**Pteridospermae.** Seed-ferns. The long-extinct seed-ferns were plants with fern-like foliage that bore seeds. Some were of tree-size. Devonian or Mississippian to Permian (and possibly to Jurassic). Common in the Pennsylvanian.

**Other Gymnosperms.** Cycads, cycadeoids, ginkgos, cordaitaleans, and conifers. Cycads and cycadeoids are palm-like plants with strikingly ornamented bark and fern-like leaves; they are essentially Mesozoic in age but there are a few survivors living today. Of the ginkgos but a single species survives; this is the maidenhair tree with its fan-shaped leaves. Cordaitaleans were ancestral conifers; some were tall slender trees with strap-like leaves; Devonian to Triassic. Conifers or cone-bearing evergreens are shrubs or trees with small flat or needle-shaped leaves; these are the familiar softwood forest trees; Pennsylvanian, chiefly Triassic to Present.

**ANGIOSPERMAE.** Angiosperms or covered-seed plants, including most grasses, shrubs, flowering plants, and hardwood or deciduous trees. Triassic (?), Jurassic, chiefly Cretaceous to Present. Represented in the fossil record by coalified wood, silicified (petrified) wood, and imprints of leaves. The angiosperms are subdivided into two groups.

**Monocotyledons.** With parallel-veined leaves, as in grasses, lilies, and palms. The wood does not generally exhibit growth rings.

**Dicotyledons.** With net-veined leaves, as in most flowering plants, bushes, shrubs, and deciduous forest trees. Annual growth rings are often well developed.

### Synopsis of Animals

All except the last phylum are invertebrates; most of the fossil invertebrates of New Mexico are marine forms. Many phyla and classes not well represented in New Mexico's fossil record are omitted here.

**PROTOZOA.** Protozoans are simple one-celled, generally microscopic animals. Most members of the order Foraminifera ("forams") are marine and secrete a calcareous or limy shell, generally divided into chambers; this order ranges from Cambrian to Present. Most conspicuous of the Foraminifera are the fusulinids, which often attained the size of a grain of wheat or larger and flourished during the Pennsylvanian and Permian. Extraordinarily abundant and diversified in New Mexico.

**PORIFERA.** Sponges, the first of the many-celled animals. Many fossil forms had an internal skeleton composed of microscopic spicules of silica or lime. Cambrian to Present. Not common in New Mexico.

**COELENTERATA.** Hydrozoans, corals, and related groups.

**GRAPTOZOA.** Graptolites are long-extinct colonial animals with a chitinous exoskeleton. Fossils resemble pencil markings on bedding planes of sediments. Cambrian to Mississippian, chiefly Ordovician and Silurian. Exceedingly rare in New Mexico.

**STROMATOPOROIDEA.** Stromatoporoids constitute another extinct group, resembling hydroids and fine-grained colonial corals. They secreted calcareous laminated exoskeletons superficially resembling those of some of the calcareous algae. Cambrian to Devonian, chiefly. Not common in New Mexico.

**ANTHOZOA.** Corals and sea anemones. The stony corals include 1) solitary cup and horn corals, and 2) compound or colonial corals. The group exhibits an amazing diversity in size and shape. Ordovician to Present. Notably abundant in Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian rocks of New Mexico.

**BRYOZOA.** Bryozoans are the colonial moss animals or sea mats, sometimes resembling seaweeds. The limy skeletons are lacy and delicate, fan-like, branching and twig-like, often incrusting other organisms; sometimes massive and then resembling stromatoporoids and the finer grained colonial corals. Ordovician to Present. Especially common in the Devonian, Mississippian, and Pennsylvanian of New Mexico.

**BRACHIOPODA.** Brachiopods or lamp-shells. One of the most conspicuous, extensively studied, and best known groups of fossil invertebrates. These animals have a phosphatic or calcareous bivalved shell, generally attached to the sea bottom by a fleshy stalk or pedicle and sometimes by spines. Each of the two valves is bilaterally symmetrical and one valve is larger than the other. Some are smooth but many are ornamented with concentric and radial sculpture, ribs, frills, nodes, and spines. Cambrian to Present. Abundant from Cambrian to Permian but relatively uncommon in Mesozoic and Cenozoic strata of North America; a few dozen species survive in modern seas.

**MOLLUSCA.** A large and highly diversified group of marine, fresh-water, and terrestrial (land-dwelling) invertebrates. Some are naked but the great majority are shelled.



**PELECYPODA.** Pelecypods or bivalved molluscs, including clams, mussels, oysters, and scallops. Each of the two valves is asymmetrical; typically one valve is the mirror image of the other (not true for oysters). Many are marine but some are fresh water. Some are attached to the sea bottom; some swim; some burrow into sediment, wood, or rock. Ordovician to Present. Not common in New Mexico until Pennsylvanian time; most numerous in the Cretaceous.

**SCAPHOPODA.** Scaphopods or tusk-shells, with a single, curved tubular shell. Ordovician to Present. Generally rare, but found locally in Pennsylvanian and Permian.

**GASTROPODA.** Gastropods include the snails, conchs, drills, limpets, abalone, etc. They possess a single unchambered shell, generally coiled in an ascending spiral; the animal carries its shell on its back and can retreat into it. Most are marine but some are fresh water and some dry land. Cambrian to Present. In New Mexico, not uncommon in Paleozoic strata and common in the Cretaceous.

**CEPHALOPODA.** Cephalopods include marine forms such as nautiloids, squid, octopus, and the extinct ammonoids. Generally possess a single chambered shell which may be straight, curved, or loosely to tightly coiled in a single plane like a watch spring. Many moved by jet propulsion. The pearly or chambered *Nautilus* is a survivor of a large group of nautiloids, chiefly Paleozoic in age, with simple sutures. (A suture is the junction between the outer shell and the septum or partition separating adjoining chambers.) The ammonoids, with their complex sutures, are an extinct group that ranged from Devonian to the end of the Cretaceous. Sometimes the pearly layer is preserved in fossil shells. In New Mexico fossil cephalopods are abundant in Ordovician, Pennsylvanian, and Permian; they are most numerous in the Cretaceous.

**ANNELIDA.** Annelids or segmented worms. Marine, fresh water, or terrestrial. Some annelids build calcareous tubes; burrows and trails are commonly found; microscopic jaws and teeth are sometimes preserved. Precambrian to Present.

**ARTHROPODA.** Arthropods have segmented bodies with jointed appendages, inclosed in an exoskeleton of chitin. One of the most advanced groups of invertebrates, adapted to life in marine and fresh waters, on land, and in the air. Cambrian to Present.

**TRILOBITA.** Trilobites are a long-extinct marine group characterized by a trilobed and segmented body. They are distant relatives of crab, crayfish, and lobster; each individual sheds its horny armor by moulting as it grows. Cambrian to Permian. It is generally the tail shield or pygidium that is found fossil.

**CHELICERATA.** Chelicerates include eurypterids ("sea scorpions") and arachnoids (spiders and scorpions). Generally uncommon as fossils from Cambrian to Present. Practically no record of this group in New Mexico.

**CRUSTACEA.** Crabs, shrimp, crayfish, lobsters, ostracods, etc. Few representatives of Crustacea other than ostracods have been reported from New Mexico. The ostracods are bivalved forms, often minute in size, resembling tiny clams; marine, brackish, and fresh water. Ordovician to Present. Relatively scarce in New Mexico except in the Pennsylvanian.

**INSECTA.** Fossil remains of insects are generally uncommon and fragmentary. Pennsylvanian to Present. Almost unknown in New Mexico.

**ECHINODERMA.** Echinoderms are spiny-skinned animals whose skeletons are composed of small limy plates embedded in the skin. Most exhibit a five-rayed symmetry. All are marine. Cambrian to Present.

**PELMATOZOA.** Typically plant-like, with a cup or calyx attached to the sea bottom by a long, flexible stem or column.

**Cystoidea.** Extinct cystoids. Short stem or none at all. Scarce. Cambrian to Devonian.

**Blastoidea.** Extinct blastoids or sea-buds. Short stem or none at all; often called fossil

"hickory nuts." Ordovician to Pennsylvanian in North America; abundant only in the Mississippian.

**Crinoidea.** Crinoids or sea-lilies and feather-stars. They generally have a long, flexible column; the button-like disk-shaped segments and solid or broken calyces are locally conspicuous in New Mexico Mississippian and Pennsylvanian strata. They are gregarious animals, often making a major contribution to bulk of rock. Ordovician to Present.

**ELEUTHEROZOA.** The free-living echinoderms.

**Stelleroidea (Asteroidea).** Starfishes and brittle-stars. Cambrian to Present. Generally scarce as fossils, and especially rare in New Mexico.

**Echinoidea.** Echinoids, including sea urchins, heart urchins, and sand dollars. Characterized by a globular, biscuit-shaped, heart-shaped, or flattish exoskeleton, often covered with a large number of movable spines. Ordovician to Present. The spines are locally common in the Pennsylvanian and Permian of New Mexico; complete tests are rare except in the Lower Cretaceous.

**INCERTAE SEDIS: CONODONTS.** Microscopic tooth-like fossils called conodonts are of unknown affinity. They may represent teeth or internal gill supports of some extinct fish or fish-like animal and are found from Ordovician to Triassic. In New Mexico conodonts have been reported from Ordovician, Devonian, Pennsylvanian, and Permian strata (unpublished information).

**CHORDATA.** Most advanced of animals. The chordates possess a cartilaginous or bony notochord, the backbone, and a spinal nerve cord.

**VERTEBRATA.** Characterized by a skull and a vertebral column of cartilage or of cartilage and bone. Ordovician to Present.

**AGNATHA.** Jawless vertebrates: extinct ostracoderms and living lampreys of rivers, lakes, and seas. Ordovician to Devonian; Present. Not yet known in New Mexico but fossils of these earliest vertebrates occur in the Ordovician of Colorado.

**PLACODERMI.** Armored "fishes" with primitive jaws. Silurian to Permian. Rare in Devonian of New Mexico.

**CHONDRICHTHYES.** Cartilage "fishes": sharks, rays, and skates. Mostly marine. Generally only the teeth are preserved as fossils. Devonian to Present. Several kinds have been found in the Paleozoic and Cretaceous rocks of New Mexico; a few fresh-water sharks are known.

**OSTEICHTHYES.** The true fishes: lung fishes and bony fishes. Most have scales and some bone as well as cartilage in the "backbone." Marine and fresh water. Devonian to Present. A few species have been found in New Mexico Jurassic, Cretaceous, and Cenozoic rocks.

**AMPHIBIA.** Salamanders and frogs. These are the first of the tetrapods or four-legged land animals. Devonian to Present; in New Mexico, chiefly Permian.

**REPTILIA.** Extinct dinosaurs, pterosaurs, phytosaurs, ichthyosaurs, plesiosaurs, mosasaurs, and several other orders; also surviving orders, including crocodiles, lizards, snakes, turtles, and tortoises. These are the first true land vertebrates, laying air-breathing eggs. Fossils are generally found in sediments of rivers and lakes. Pennsylvanian to Present. New Mexico has yielded numerous remains of Permian to Cenozoic age.

**AVES.** Birds. Jurassic to Present. Exceedingly rare in the Cenozoic of New Mexico, except in Pleistocene to Recent cave deposits.

**MAMMALIA.** Mammals. Most advanced of all vertebrates and the dominant land animals of the Cenozoic era and the modern world. Latest Triassic or earliest Jurassic to Present. Abundant locally in the Cenozoic sediments of New Mexico.

## CHRONOLOGICAL RESUME OF EARLY DISCOVERIES OF FOSSILS

Certain highlights of early notices and accounts of notable fossil discoveries are set forth in this section. These are presented in chronological order from the earliest days up to 1888. Beginning with prehistoric time these take us through the Spanish period (1539-1821), the period when New Mexico was first a province and later a territory of the Republic of Mexico (1821-1846), and into the period when New Mexico was a territory of the United States (1846-1912). The resume is not continued into statehood (1912—).

*Prehistoric Time.* The prehistoric inhabitants of New Mexico occasionally collected fossil shell, bone, and wood but we have no indication of what they thought about these materials. The button-like segments of crinoid stems were used in making bracelets and necklaces.

1539-1840. Early Spanish explorers and colonists must have seen and collected specimens from time to time but I have never seen any mention of fossils in the several chronicles and narratives of the early expeditions. This is rather surprising in view of the many references to ores of silver, copper, and lead; to minerals, such as turquoise, gold, silver, copper, salt, garnet, peridot, alum, sulfur, azurite, malachite, lodestone, selenite, mica, jet, etc.; and to various rocks.

1841. Thomas Falconer, a Fellow of the Geological Society of London, was a scientific observer attached to the ill-fated Texan-Santa Fe expedition, which entered New Mexico near Tucumcari and traveled westward. He and other members were arrested October 5, 1841, and most of his "papers, as well as those of [his] companions . . . were, together with a collection of shells and minerals which [he] had made, taken possession of, with the baggage of [his] party, by the Mexican authorities in New Mexico." Thus New Mexico's first geologist was off to a good start!

1844. The earliest definite reference to fossils is by Josiah Gregg, most famous of the Santa Fe traders, who made several trips to New Mexico during the 1830's. In his diary, *Commerce of the Prairies*, published in 1844, he described beautiful specimens of silicified wood near Cerrillos on land that later (1900) became the Sweet ranch. He wrote that one log "lies between Santa Fe and the Placer, broken into blocks since its petrification, which shows every knot, crack and splinter almost as natural as in its ligneous state. It is said that there are some of these arboreous petrifications in the vicinity of Galisteo, still standing erect."

1846. This was a notable year for geological observations were made by three men engaged in military exploration.

F. A. Wislizenus, M.D., was scientific observer with Col. Doniphan's expedition, which explored the territory in June, July, and August. They traveled through the northeastern corner to Las Vegas, Santa Fe, and Albuquerque, and went south to El Paso. On June 25, "Reaching the Gallinas creek, near Las Vegas . . . I met, after a long interval, with limestone again. It was a dark blue, with casts of *Inoceramus* of the cretaceous series." (This was the Upper Cretaceous Greenhorn limestone with its distinctive guide fossil *Inoceramus labiatus*.)

In another connection, he wrote of this same locality: "The bluffs here consist of a dark-bluish, shistose [sic] limestone, with fossils belonging to the cretaceous formation. About a mile from the creek lies the small town of las Vegas, or Gallinas, a village of 100 and odd houses."

A few days later, near Cerrillos, "I met everywhere with a red and brown sandstone, looser or more compact, and with large masses of petrified wood."

Lieut. W. H. Emory was in New Mexico during August, September, and October. He made a number of geological observations, chiefly of minerals, but did not mention any fossils.

Lieut. J. W. Abert was in the territory between September, 1846 and January, 1847. He also entered near Raton, traveled to Santa Fe, both the Old and New Placers near Golden, and then went westward across the Rio Grande and Rio Puerco to Acoma. Thence he turned eastward to the Manzano Mountains, southward to Socorro, and finally returned to Raton. On September 29 at Cerrillos he saw "fragments of immense petrified trees." Near Poblazón, in the valley of the Rio Puerco not far from Cabezón, on October 17 he found "sandstone, containing shark's teeth, shells, and bones of fish, many of which we collected. . . . We found, also, fragments of large ammonites, and pieces of *inoceramus*." West of Albuquerque, between Correo and the Rio Puerco, he saw an abundance of petrified wood.

Abert's collections of fossils and minerals were submitted to Prof. J. W. Bailey and his 2-page report, entitled *Notes concerning the minerals and fossils, collected by Lieutenant J. W. Abert, while engaged in the geographical examination of New Mexico, by J. W. Bailey, professor of chemistry, mineralogy, and geology at the United States Military Academy*, was appended to Abert's 130-page report, published in 1848 as a Congressional Document. The following quotations are from Bailey's report:

"The fossils from Poblazón consist of gigantic hippurites, casts from the cells of several species of ammonites, valves of *inocerimus* [sic] . . . casts of small univalves and bivalves too imperfect for determination; and teeth of sharks.

"The fossils accompanying the well characterized bituminous coal from the Raton, consists chiefly of large ovoid leaves, with very distinct branching veins, which consequently must have belonged to decotylédonous [sic] plants of comparatively modern origin. It is an interesting fact that no ferns,

or other of the common coal fossils were found. It is thus established beyond a doubt, that the deposit of coal at the Raton is not the equivalent of the great coal formation of the United States, but is of a much more recent date. . . .

"The existence of coal on the eastern flank of the Rocky mountains has been noticed before, and some have supposed that it indicated the western outcrop of the great carboniferous formations of the western States; this view, however, is not confirmed by the deposit at the Raton, which is decidedly a far more recent formation."

Bailey's penetrating observations and recognition of the distinction between the Pennsylvanian coals of eastern United States and the Cretaceous-Paleocene coal of New Mexico constitute an important contribution to knowledge. The Abert-Bailey report is accompanied by 24 unnumbered lithograph plates. The 22nd plate depicts two leaves from Raton; the 23rd depicts an *Inoceramus* and a leaf; the 24th shows four shark's teeth and six gastropods from Poblazon and "fossils from the lead mine at Tuerto [Golden]." The latter include a brachiopod and a shark's tooth. These seem to be the earliest illustrations of any New Mexico fossils.

1849. In his report on the route from Fort Smith, Arkansas to Santa Fe, Capt. R. B. Marcy notes that on June 17 near Tucumcari, "A section of the vertebra of a buffalo, with several ribs attached, in a petrified state, was found today; also, several petrifications of pieces of wood and muscles [mussels]."

In his *Journal of a military reconnaissance, from Santa Fe, New Mexico, to the Navajo Country made with the troops under command of Brevet Lieutenant Colonel John M. Washington, chief of Ninth Military Department, and Governor of New Mexico, in 1849*, Lieut. James H. Simpson (1852) reported on their Eighth Camp, located somewhere near the divide between the Rio Puerco and Rio Chaco, Aug. 26, 1849, as follows: "In this basin we found some beautiful specimens of petrified wood—in two instances the trunks of the trees still standing erect and in situ. One of these trunks was two feet high by two in diameter, and the other three feet high by two and a half in diameter. In another instance, a trunk of a tree, in its petrified state, had fallen over and split open, the parts lying together as if they had but just been cleft with an axe. For a sketch of two of these petrifications, see Plates 18 and 19. Do not these petrifications show that this country was once better timbered than it now is?"

The legend for Plate 18 gives "Height, 3 ft. Diameter 2½ ft."; for Plate 19: "Length, 4 ft. Diameter, in its integrity 2½ ft." The plates bear the notation: "Printed in colours at P. S. Duval's Steam lith. Press Establ. Phila." and constitute the second illustration of New Mexico fossils and the first in color.

1853-56. In 1853 the Congress authorized explorations for a railroad route to the Pacific coast. Several parties were sent out in the spring of 1853 by

the Secretary of War, Jefferson Davis. Thomas Antisell was geologist for the John G. Parke expedition along the 32nd parallel. W. P. Blake and the French-Swiss geologist, Jules Marcou, accompanied Lieut. A. W. Whipple on his expedition along the 35th parallel, which left Fort Smith, Arkansas on June 16, 1853, traveled across the Texas Panhandle, and reached Tucumcari Sept. 22. Here Marcou found an abundance of oysters, noting "I have seen there myself at least two or three thousand," which he took to be a variety of *Gryphaea dilatata*, a characteristic species of the Upper Jurassic Oxford Clay of England. He later named his new variety *Gryphaea dilatata tucumcarii* and in a paper read before the Société Géologique de France claimed to have discovered the first Jurassic rocks and fossils in all of North America. (Ironically, we now regard the Tucumcari outcrops as Lower Cretaceous, not Upper Jurassic.)

The expedition continued westward, reached Cerrillos Oct. 3, Albuquerque (population of 2,500 in the town and its environs) Oct. 5, and Tijeras Canyon, Oct. 8. Marcou and Dr. John Bigelow, the botanist of the expedition, started the ascent of the east slope of the Sandia Mountains Oct. 8 and achieved the crest on Oct. 10. Marcou collected Pennsylvanian and Cretaceous fossils from several localities in the Albuquerque-Galisteo-Pecos area. In 1854 Marcou became ill and decided to take all his fossils, minerals, and rocks to France and work up his report there. He packed up and prepared to sail. This proposal displeased Jefferson Davis, who insisted Marcou stay in this country until he had completed and submitted his report. But Marcou sailed and was then ordered to turn his collections over to the U.S. Ambassador in Paris. This he eventually did only in part; some of the fossils and apparently most of the rocks were returned to Washington and given to Blake, who studied the rocks and sent the fossils to James Hall at Albany for identification. Hall appears to have received part of the collections from Pecos but not those from Tijeras Canyon or the Sandia Mountains. In 1856 the Whipple-Blake-Marcou report was published as a Congressional Document; Marcou's field notes in French are given in left-hand columns and a translation by Blake in right-hand columns.

1858. Marcou published several papers written in French in various journals during the period 1854-1857 and, in 1858, a book written in English, modestly entitled *Geology of North America* and containing a chapter, "Geology of New Mexico." The book was printed in Zurich and contains hand-colored maps and descriptions and excellent lithographed illustrations of a number of new species of Pennsylvanian and Upper Cretaceous fossils, as follows.

### *Pennsylvanian Fossils*

*Spirifer Rocky-Montani*, a brachiopod. "I found this beautiful species in the Mountain Limestone of Tijeras, Canon of San Antonio, New Mexico;

where it is not rare." *Orthoceras Nova-Mexicana*, a nautiloid cephalopod. "In a block of blue limestone . . . in a deep ravine near the summit of the Sierra de Sandia." *Myalina Apachesi*, a pelecypod. "Near the ranchos of Pecos village." *Orthis Pecosii*, a brachiopod, and *Terebratula Rocky-Montana*, another brachiopod, from near Pecos village.

### Upper Cretaceous Fossils

*Ammonites Novi-Mexicani*, an ammonoid cephalopod. "Not far from Albuquerque and also las Lunas." *Inoceramus Lerouxii*, a pelecypod. From Rio Galisteo, named for his "friend and traveling companion, the celebrated guide and mountaineer Antoine Leroux." *Ptychodus whipplei*, a shell-crushing type of shark or ray tooth. From 3 miles north of Galisteo. "I dedicate this beautiful species of cretaceous fish to my friend Capt. A. W. Whipple, the able and learned chief of our Exploration in the Rocky Mountains."

In addition to establishing these new species, Marcou described and illustrated a number of old species, that is, species already described and named from other areas, including Great Britain.

Baldwin Möllhausen, who was topographical draughtsman and naturalist to Whipple's party, kept his diary in German; this was first published in German (*Reise vom Mississippi nach den Küsten der Südsee*) and later translated into English and published in two volumes in London (1858) as *Diary of a journey from the Mississippi to the coasts of the Pacific with a United States Government expedition*. Near Tucumcari, he reported, was a tributary to the Canadian River known as Fossil Creek. "The name expresses its peculiar characteristic, as its bed is full of fossil, oyster, and other shells; though they do not originate here, but have been washed down from the high land, and rolled on as far as the Canadian; which appears so much the more evident, when you see that the table rock, a few miles westward from Tucumcari, is traversed by a stratum of fossil oyster shells."

And a few pages later he refers to "a white layer of fossil oyster shells, belonging to the Jura formation." In the valley of Rio Seco he collected petrified wood from Triassic rocks. Many years later F. H. Knowlton (1888) observed that up to that time the only such "material that has been examined microscopically from this part of the country, so far as I am able to learn, was that collected by Dr. Baldwin Möllhausen, a German traveler, in the valley of Rio Seco, New Mexico, about the year 1854. . . . These specimens were submitted to Dr. H. R. Göppert, of Berlin, who reported upon them. . . . Among these specimens Göppert detected a new species, which, in honor of the discoverer, he named *Araucarites Möllhausianus*, but did not indicate any of the characters upon which it was founded, nor can I find that it was ever subsequently described." This is probably the same species that Knowlton named *Araucarioxylon arizonicum*.

Turning our attention now to southeastern New Mexico, we may note that the first important collection of Permian fossils in all of North America was made in 1855 in the Guadalupe Mountains west of Carlsbad by George Getz Shumard, geologist with Captain Pope's expedition in search of water along the stagecoach routes. He mistook these fossils for Pennsylvanian species but fortunately sent them to his brother, Benjamin Franklin Shumard, M.D., a paleontologist, who recognized them as Permian and announced this discovery at a meeting of the Academy of Science of St. Louis in 1858. (This was all the more remarkable because it was only thirteen years after the founding of the Permian system by Murchison, Verneuil, and Keyserling in their great classic, *The geology of Russia in Europe and the Ural Mountains*.) The Shumard brothers published several papers in 1858 and 1859. 1859. In his paper entitled *Notice of Fossils from the Permian Strata of Texas and New Mexico, obtained by the United States Expedition under Capt. John Pope for boring Artesian Wells along the 32d Paral., with Descriptions of New Species from these Strata and the Coal Measures of that region*. B. F. Shumard described a coral, brachiopods, a pelecypod, gastropods, a nautiloid, and fish scales.

Prof. John Strong Newberry, of Columbia University, accompanied Capt. J. N. Macomb's exploring expedition from Santa Fe to the junction of the Grand and Green Rivers of the Great Colorado of the West. (The report was prepared in 1860 but publication was delayed until 1876.) Newberry described two new species of cycads, *Zamites occidentalis* and *Otozamites macombii*, from the Triassic strata of the copper mines near Abiquiu. He observed that the copper "occurs in the form of sulphide of copper and iron, (erubescite,) and green carbonate, replacing trunks of trees and fragments of wood." He saw silicified wood near Cerrillos, an abundance of petrified wood along the west base of the Nacimiento Mountains, and, on the San Juan River a few miles below the mouth of Cañon Largo, "water-worn, silicified, carbonized, calcified, or gypsumized wood." He also described and illustrated some Pennsylvanian fossils, including a new species of shark tooth, from the vicinity of Santa Fe.

1861. Newberry wrote the geological report in *Report upon the Colorado River of the West, explored in 1857 and 1858 by Lieutenant Joseph C. Ives, Corps of Topographical Engineers, under the direction of the Office of Explorations and Surveys, published by the U.S. War Department as a Congressional Document*. He noted that along the Arizona-New Mexico line, silicified wood "is scattered about in the greatest profusion." Newberry listed various fossils from Pennsylvanian and Cretaceous strata of northwestern New Mexico. He described *Allorisma capax*, a new clam, from the Carboniferous of Agua Azul near the base of Mt. Taylor, and *Productus nodosus*, a new brachiopod, from Santa Fe.

1870. F. B. Meek published *A preliminary list of fossils collected by Dr. Hay-*



den in Colorado, New Mexico, and California with brief descriptions of a few of the new species.

1871. Governor Army received from W. H. Holmes part of a mammoth, *Elephas columbi*, from Pleistocene sediments near Fort Stanton, Lincoln County. Cope published two papers: *On reptilian fossils from New Jersey, New Mexico, and Kansas* and *On some species of Pythonomorpha from the Cretaceous beds of Kansas and New Mexico*. Prof. Edward Drinker Cope, of Philadelphia, was one of the leading vertebrate paleontologists of his day. Between 1871 and 1893, he wrote a total of 66 papers on New Mexico fossils and geology.

1873. Joseph Leidy, another eminent paleontologist, received a tooth of *Elephas columbi* from Santa Fe. From older rocks he named a new mastodon, *Mastodon obscurus*.

1874. Cope came to New Mexico in August with the Wheeler Survey. At El Rito (northeast of Abiquiú) he saw some teeth and wrote his wife: "They were nothing more nor less than my old *Bathmodon* of Wyoming." These teeth, now assigned to *Coryphodon*, were the first lead to the existence of Eocene mammals in the Southwest. In the Miocene-Pliocene Santa Fe formation near San Ildefonso (an Indian pueblo not far from Española and Los Alamos) Cope found mastodons, camels, horses, deer, dogs, and crocodiles. In his *Report on the geology of that part of northwestern New Mexico examined during the field-season of 1874*, by E. D. Cope, paleontologist and geologist, which was published as Appendix G1 (p. 61-97) of G. M. Wheeler's *Annual report upon the geographical explorations and surveys west of the one hundredth meridian . . .*, Cope observed:

"The earliest information which we possess respecting the existence of vertebrate remains in the lacustrine deposits of the Rio Grande Valley is due to the interest displayed by Hon. Wm. F. M. Army, then governor of New Mexico. He obtained from the region northwest of Santa Fe the fragments of a lower jaw of a *Mastodon productus*, Cope, and sent them to the Smithsonian Institution. This specimen formed the subject of a description by Dr. Leidy, who referred the species to his *Mastodon obscurus*. The next observations of vertebrate fossils were made by the members of your expedition of 1873. Francis Klett obtained a number of specimens from near San Ildefonso. Following the directions of this gentleman, I made the examination during the season of 1874 which resulted in the discovery of twenty-nine species of Vertebrata, of which all but four are determinable."

Cope collected here from Aug. 14 until Sept. 3, when he left for Tierra Amarilla. Simpson (1948) continues the story:

"His orders from Wheeler called for continuing this journey northward to Pagosa Springs, Colorado, but this would have meant giving up the discovery of the source of the *Coryphodon* teeth seen at El Rito. Cope there-

fore disobeyed his orders, insubordination which gave rise to trouble and dissension but was later smoothed out, and doubled back southward to and up the Gallina River, north and northwest of San Pedro Mountain in what is now Rio Arriba County . . . .

"On [Sept. 7], Cope rode southward from Yegua Canyon and entered a large area of Eocene badlands where in the first three or four hours he found, by his reckoning, twenty-one species of fossil vertebrates. These included four sharks (almost certainly secondary, redeposited from underlying Cretaceous beds), three crocodiles, five turtles, and nine mammals, notably two species of 'Bathmodon' = *Coryphodon*."

In a letter to his father, Cope wrote that this was "the most important find in geology I ever made." On Oct. 11, from his camp northwest of Nacimiento (Cuba), he reported the exciting discovery of a group of ninety species from one bed! These discoveries and later ones of Paleocene fossils, leading to the recognition and firm establishment in North America of the Paleocene epoch, were a major item in Cope's rise to fame.

During the period 1874-1894, Charles Abiathar White wrote a series of reports on fossil invertebrates.

1875. Dr. Oscar Loew, mineralogist and chemist for the Wheeler Survey, noted that near Jemez Springs "The red sandstone . . . contains here and there small deposits of copper-ore, chalcocite and malachite, with impressions of *Calamites*." Along the Rito Peñas Negras, a tributary of the Rio de las Vacas, in the Jemez country, he saw "fossils covered with hematite." (Pennsylvanian brachiopods, especially *Composita* and *Neospirifer*, are sometimes found with vivid scarlet color in this area.)

G. K. Gilbert sent specimens of mastodon, rhinoceros, and camel from near San Ildefonso to Prof. Othniel Charles Marsh, at Yale. Marsh and Cope became bitter rivals, each trying to outdo the other in describing new genera and species of vertebrates. The colorful bone collector, David Baldwin, began work for the Wheeler Survey.

1876. In the long-delayed report of the Macomb expedition, Meek described a number of Cretaceous fossils collected by Newberry in 1859. Baldwin began collecting for Marsh (see beyond).

1877. Cope reported on *Elephas columbi* from Placitas, at the north end of the Sandia Mountains, and on phytosaurs from Triassic rocks at another locality. Meek named a new species of Pennsylvanian ammonoid, *Goniatis goniolobus*, which later became the type of a new genus, *Gonioloboceras*.

In volume 4, *Paleontology*, a quarto volume three inches thick, of the seven-volume Report upon the United States Geographical Surveys West of the One Hundredth Meridian, in charge of First Lieut. Geo. M. Wheeler, Corps of Engineers, U.S. Army, under the direction of Brig. Gen. A. A. Humphreys, Chief of Engineers, U.S. Army, published by authority of the Honorable the Secretary of War . . . . there are two parts:

## NEW MEXICO'S FOSSIL RECORD

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Part 1, Report upon the invertebrate fossils collected in portions of Nevada, Utah, Colorado, New Mexico, and Arizona, by parties of the expeditions of 1871, 1872, 1873, and 1874, by Charles A. White, M.D., 219 p., 21 pls.

Part 2, Report upon the extinct Vertebrata obtained in New Mexico by parties of the expedition of 1874, by Prof. E. D. Cope, 370 p., 83 pls.

White described and illustrated 10 species of fossils, mostly brachiopods and corals, from the Ordovician of the Silver City area; 25 species, mostly brachiopods and pelecypods, from the Pennsylvanian of the Santa Fe and Zuñi Mountains areas; and 16 species, mostly pelecypods, gastropods, and ammonites, from the Upper Cretaceous of several localities in northwestern New Mexico. Many of these are old species but 7 had been described as new by White in a preliminary report the previous year and 5 were newly named in 1877.

In his report Cope described and illustrated a total of 136 species of vertebrates: 4 from the Triassic, 13 from the Cretaceous, 87 from the Eocene, 30 from the upper Miocene, and 2 from the "Postpliocene." Cope stated that "The first vertebrate fossils ever determined from the Trias of the Rocky Mountains are included in this report. The first discovered were obtained by Professor Newberry while attached to Captain Macomb's expedition, and are now described for the first time."

The 87 species of vertebrates from the "Wasatch Eocene" of New Mexico included 8 fishes, 24 reptiles (2 lizards, 6 crocodiles, and 16 turtles or tortoises), 1 bird, and 54 mammals (3 rodents, 4 taeniodonts, 2 insectivores, 11 mesodonts, 13 creodonts, 8 amblypods, 10 perissodactyls, and 3 incertae sedis). Referring to *Coryphodon*, Cope wrote: "The remains of this genus have been preserved in greater abundance in the Wasatch beds of New Mexico than in any other known region of the world, so that a good opportunity is offered for an elucidation of the structure of its skeleton. The bones obtained include all parts of the skeleton and skull." Remains of more than 150 individuals of several species of this genus were collected. Of the new bird, *Diatryma gigantea*, he wrote:

"This species was of large size, the proximal end of the tarsometatarsus being nearly twice the diameter of that of the Ostrich. Its discovery introduced this group of Birds to the known faunas of North America, recent and extinct, and demonstrates that this continent has not been destitute of the gigantic forms of Birds now confined to the southern hemisphere faunas."

Cope's fauna from the Santa Fe formation of the Española basin, which he assigned to the Loup Fork epoch, included 2 tortoises, 3 birds (one of them "a rapacious Bird, in size intermediate between the Turkey Vulture . . . and the Golden Eagle"), and 29 mammals (4 rodents, 1 mastodon, 6 perissodactyls, 11 artiodactyls, 5 carnivores, and 2 incertae sedis). He added

that "The fossils of this epoch from Colorado and New Mexico which I have described were all found in place by myself, and excavated by my own hands or in my presence."

1878. David Baldwin, the professional bone collector from Farmington who roamed northwestern New Mexico with his faithful burro during the 70's and 80's, discovered fossil reptiles in the Permian red beds of the Chama-Jemez region in 1877. Prof. A. S. Romer (1950) continues this story:

"[Baldwin] shipped a considerable quantity of material to New Haven. Marsh, however, did not realize its value (most of it was not even unpacked for decades) and, becoming dissatisfied with Baldwin, soon dispensed with his services. (To Marsh's later regret, we may suppose, for he was then hired by Cope and shortly discovered the important Paleocene beds of the San Juan Basin.) He collected some further Permian materials for Cope but that worker paid as little attention to such fossils as had Marsh.

"In fact, in its early history, this fauna has its only importance in that it added fuel to the growing controversy between Cope and Marsh. In the spring of 1878, at a meeting in Philadelphia, Cope described the discovery of an important series of Permian vertebrates from Texas. Marsh was present and, remembering the unstudied Baldwin material, left the meeting early (so runs the legend), dashed back to New Haven, unwrapped a few packages, and wrote a hasty four-page article describing several new genera and species. So superficial was this work that two species which he described as belonging to a single genus consist of the pelycosaur *Ophiacodon* and an amphibian of the genus *Eryops*. He rushed this to press in the *American Journal of Science* and thus 'beat' Cope to publication. The latter was naturally aggrieved at this unethical conduct and (it is said) pre-dated his own paper in an attempt to recover priority!"

In his hastily written paper Marsh described three new genera and four new species: *Nothodon lentus*, *Ophiacodon mirus*, *O. grandis*, and *Sphenacodon ferox*.

1880. Collecting for Cope, Baldwin discovered the entirely new Paleocene Puerco fauna, on the basis of which Cope established the Paleocene epoch for New Mexico.

1881. S. A. Miller, Esq., of Cincinnati, reported on a collection of Mississippian fossils made by Cope at Lake Valley in southwestern New Mexico. In this paper, *Subcarboniferous fossils from the Lake Valley mining district of New Mexico, with descriptions of new species*, he named 11 new species (4 crinoids, 1 bryozoan, 1 gastropod, and 5 brachiopods), and identified a number of old species. One of the new crinoids was named *Actinocrinus dalyanus* for George Daly, manager of the famed Lake Valley silver mines, who was killed by Apache Indians 6 miles from camp on the very day in 1880 that the fabulous Bridal Chamber was discovered—one of the richest bodies of silver ore in the world.

1888. Cope published a total of twenty-two papers this year, including his "final" report on the Puerco fauna, in which he described 106 species. Knowlton described *Araucarioxylon arizonicum*, the common conifer of the Petrified Forest of Arizona. This new species was founded on one trunk from near Fort Wingate, New Mexico, and two trunks from Arizona. The New Mexico specimen was a log 11 feet long and 2½ feet in diameter; it was perfectly silicified, the exterior light gray and the interior nearly black.

Time and space do not permit extending this resume beyond 1888. A few highlights will be presented later. Suffice it to say here that Paleozoic and Cretaceous marine invertebrates have been collected for many schools, museums, and the U. S. Geological Survey. Land plants have gone mostly to the Geological Survey and the National Museum. Notable collections of Permian and Triassic amphibians and reptiles have been made for Yale's Peabody Museum, the Academy of Natural Sciences of Philadelphia, the universities of Michigan, Chicago, Oklahoma, Harvard, California at Berkeley, the National Museum, the American Museum of Natural History in New York, and others. Upper Cretaceous turtles and dinosaurs have gone to Washington and New York; a complete dinosaur skeleton went to the Paleontological Institute at Upsala, Sweden.

Paleocene and early Eocene mammals have gone chiefly to Philadelphia, New York, Berkeley, Washington, St. Louis, and Lawrence, Kansas. The Miocene-Pliocene mammals of the Española Valley have been collected in staggering quantity by Childs Frick for the famed Frick Collection at the American Museum of Natural History. Pleistocene and Recent material has been shipped to numerous museums. In addition to those cited above, other schools and museums holding collections of New Mexico material are: the California Institute of Technology, the Universities of Colorado, Nebraska, Texas, Wisconsin, and California at Los Angeles, Columbia University, Texas Technological College, Texas Western College, Colorado Museum of Natural History, Los Angeles Museum, Chicago Museum of Natural History (formerly the Field Museum), and the New Mexico Institute of Mining and Technology with its affiliated Bureau of Mines and Mineral Resources.

Indeed, so much material has been collected since about 1925 that years may elapse before some of it can be studied by paleontologists. In the case of vertebrates, especially, skillful preparators must labor long and painstakingly over the bones. As Simpson (1948) remarked, "Matrix must be picked off, grain by grain, from tiny mammal jaws under a microscope. The jack-straw piles of *Coelophysis* skeletons must be disentangled with extreme care not to damage the hollow, often paper-thin bones. It will be several years before the collections [of 1947] can be in shape for proper study."

## NEW GENERA AND NEW SPECIES

## General Survey

It seems likely that well over 100 new genera and 700 new species of fossil plants, invertebrates, and vertebrates have been founded on New Mexico specimens up to 1960. In the following table, data are more complete for the Paleozoic and Mesozoic than for the Cenozoic. In the Cenozoic, it is believed that the Paleocene and Eocene figures are fairly complete; time has not permitted exhaustive search of Miocene, Pliocene, or Pleistocene records and these are admittedly incomplete.

Era	Period or Epoch	New Genera	New Species	Total
CENOZOIC	Pleistocene (incomplete)	2	11	13
	Miocene + Pliocene (incomplete)	5	46	51
	Eocene	6	86	92
	Paleocene	50	159	209
MESOZOIC	Cretaceous	5	142	147
	Jurassic	0	1	1
	Triassic	0	15	15
PALEOZOIC	Permian	14	66	80
	Pennsylvanian	3	80	83
	Mississippian	1	18	19
	Devonian	10	43	53
	Silurian	0	0	0
	Ordovician*	0	1	1
	Cambrian	0	0	0
Total		96	668	764

\* To illustrate how rapidly these figures may change, it should be noted that late in 1961, Rousseau H. Flower described 3 new genera and 27 new species of Ordovician corals from the Montoya group, based mostly on specimens collected in the Franklin Mountains north of El Paso, Texas, but in part on material collected in New Mexico. In this paper he also described 18 new genera and 18 new species of problematical organisms attached to the corals.

In new genera based on New Mexico specimens, the Paleocene leads with 50, followed by the Permian (14), then the Devonian (10), and so on. In new species, the Paleocene again leads with 159, followed closely by the Cretaceous (142), then the Eocene (86), Pennsylvanian (80), Permian (66), and so on. The new Paleocene species are mostly mammals, reptiles, and plants. The new Cretaceous species are mostly plants and invertebrates, with some reptiles. The new Eocene species are chiefly mammals, with a few reptiles. The new Pennsylvanian species are chiefly invertebrates.

### Derivation of Scientific Names

Some explanation of the sources of the names applied to these new genera and species founded on New Mexico material seems to be in order. The scientific name of a plant or animal, living or extinct, is composed of the generic name followed by the specific name. Both names are commonly set in italic type, e.g., *Spirifer rockymontanus*. The initial letter of the generic name is capitalized but the initial letter of the specific name is not. Sometimes the scientific name is followed by the name of the author or founder of the species, e.g., *Spirifer rockymontanus* Marcou.

Generic and specific names are generally derived from Greek or Latin but may be from any language. It is generally admitted that the most desirable name is one that refers to some aspect of form or structure. However, many names are geographic or stratigraphic in origin and many are patronymic, that is, given in honor of some person. There are many other sources of names, some of which are set forth in a handbook designed for students.\* Unfortunately, many authors have not taken the trouble to explain the derivation of the new names they were proposing and the result is that we can only guess what they had in mind. One might hazard the opinion, in some cases at least, that the reason for this was that they were none too sure of their Greek and Latin. It is certainly true that many authors have not heeded Article 14 of the *International Rules of Zoological Nomenclature*, recommending that "the best specific name is a Latin adjective, short, euphonic, and of easy pronunciation."

Specific names used as adjectives must agree in gender with the generic name; thus such names end in *us* if masculine, *a* if feminine, or *um* if neuter. Geographic names often end in *ensis* or *ense*. Patronymys end in *i* if named for a man or *ae* if for a woman.

**Patronymys.** Several dozen new generic and specific names have been given in honor of paleontologists, geologists, explorers, collectors, and others who have worked in New Mexico or on material from the state. Examples of such generic names are the following:

Baldwinonus	Rakomylus
Bransonoceras	Stantonoceras
Copemys	Stockoceras
Osbornoceras	Wortmania

Specific names include the following:

andersoni	baueri (5)
bakeri	blicki
baldwini (3)	bowsheri
bassleri	bransoni

\*A Glossary of Scientific Names (chiefly of Fossil Invertebrates), Northrop, 1949.

campi (2)  
 casteri  
 conklingi  
 cooperi  
 copei (2)  
 dalyana  
 danei  
 drakei  
 duttoni  
 floweri  
 gallowayi  
 grangeri  
 greenlecorum  
 haydenianus  
 herrickana  
 hyattianus  
 jacksonorum  
 jarrovi  
 keyesi  
 kindlei  
 klausi  
 klettiana  
 knowltoni (2)  
 leei (6)  
 lerouxi  
 lesquereuxi  
 macombi (2)  
 marthae

matthewi  
 milleri  
 mooki  
 morrisi  
 morsei  
 needhami (2)  
 newberryi (2)  
 northropi (3)  
 osborni  
 pattoni  
 powelli  
 raki (2)  
 raymondi  
 reesidei (3)  
 schucherti  
 shumardi  
 shumardiana  
 simpsoni  
 springerae (for Ada Springer)  
 springeri (2) (for Frank Springer)  
 sternbergi  
 stevensoni (2)  
 thwaitesi  
 vanderhoofi  
 wheeleri  
 wheelerianus  
 whipplei  
 willistoni

The above list does not include a number of names of persons who have not been directly concerned with New Mexico paleontology. For example, the new generic name *Kruschevia* was recently proposed for a wart-like problematical organism of dubious affinities; to add insult to injury, the name was misspelled; it should be spelled *Khrushchevia*.

**Geographic and Stratigraphic Names.** An even larger number of names applied to new genera and species have been of geographic or stratigraphic origin. As already noted, many names applied to stratigraphic units are derived from some geographic feature. Examples of new generic names and their sources are as follows:

Alamosaurus (Ojo Alamo)  
 Animasaurus (Animas River)  
 Arribasaurus (Rio Arriba County)  
 Chamasaurus (Rio Chama)  
 Kimbetohia (Kimbetoh trading post)  
 Manzanella (Manzano group, in turn from Manzano Mountains)  
 Nunnacrinus (Nunn member of Lake Valley formation, in turn from the Nunn ranch)  
 Ocalientinus (Ojo Caliente)  
 Puercosaurus (Rio Puerco)  
 Taosia (Taos)



## NEW MEXICO'S FOSSIL RECORD

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Examples of new specific names are given below and sources are indicated for some of the less obvious:

abiquiense (Abiquiu)  
 alamillana  
 albuquerqucana  
 amarillensis (2)  
 andresensis (San Andres formation and  
     San Andres Mountains)  
 apachesi  
 apodacensis  
 argenturbica (Silver City) \*  
 australis (southern)  
 bearmontanensis (Bear Mountain)  
 brimhallensis (Brimhall Wash)  
 cerrillosensis (Los Cerrillos)  
 chacensis  
 chacoensis (2)  
 chamense, chamensis  
 cimarronensis  
 comudanus  
 coyotensis (Coyote Canyon)  
 cristobalensis (Fra Cristobal Mountains)  
 crucensis (Santa Cruz)  
 crucianus (Santa Cruz)  
 cruziensis (Santa Cruz)  
 cubensis (Cuba)  
 cuchilloensis  
 derrya  
 escavada (Escavada Wash)  
 fresnalensis  
 galisteoensis  
 gallinae  
 guadalupe  
 hatchetense (Hatchet Mountains)  
 hesperius (western)  
 hillsboroensis  
 ilfonsensis (San Ildefonso)  
 jarillaensis  
 jemezanas, jemezensis (Jemez Pueblo  
     and Jemez Springs)  
 kellyensis (Kelly mine)  
 kimbetovius  
 kirtlandius  
 ladronensis  
 lascrucensis (Las Cruces)  
 madridensis

manzanica, um  
 mexicana, um, us (5) (New Mexico)  
 nacimientensis (2), nacimientoensis  
 nambianus (Nambe Pueblo)  
 navajovicus, navajovius (2)  
 neohispanicum (New Spain)  
 neomexicana, um, us (15)  
 newmexicanus  
 nova-mexicana  
 novamexicana, us (3)  
 novi-mexicani  
 novimexicanum, us (4)  
 novomehicanus  
 novo-mexicanus  
 novomexicana, um, us (6)  
 occidentalis (western)  
 ojocaliensis (Ojo Caliente)  
 omeraense (Omera coal mine)  
 pecosi  
 percha, perchaensis (Rio Percha  
     and Percha shale)  
 pinosensis  
 pojoaquensis  
 poleoensis (Mesa Poleo)  
 puercensis (8), puercoensis (Rio Puerco  
     and Puerco formation)  
 ratonensis (5)  
 reginensis (Regina)  
 rhodesi (2) (Rhodes Pass,  
     San Andres Mountains)  
 riograndensis  
 robleda  
 rocky-montana, i  
 rockymontanus (2)  
 rodeoensis  
 sacramentoensis  
 sanandreasense (San Andreas  
     was formerly used)  
 sanctaefidai (Santa Fe)  
 sanjuanensis (2)  
 silverensis (Silver City)  
 slygapensis (Sly Gap)  
 socorroense, ensis (3)  
 taoensis, taosensis

\* An interesting example. A fossil brachiopod from Ordovician limestone near Silver City, it was originally named *Rhynchonella argenturbica* by White in 1874. The species was later transferred by Bassler (1915) to the genus *Rhynchotrema*, which had been established by Hall in 1860. The species now may be referred to *Lepidocyclus*, established by Wang in 1949.

todiltensis (Todilto formation,  
from Todilto Park)  
torrejonensis (3)  
tucumcarii  
tularosense

vermejoense, ensis (Vermejo formation  
and Vermejo Park)  
vespertinus (western)  
zuniensis (2)

**Names Referring to Form or Structure.** An even larger number of names applied to new genera and species of New Mexico fossils reflect some aspect of form or structure, either external or internal. Examples of new generic names are as follows:

Acanthatia: a brachiopod named for a prickly plant  
Bispinoproductus: two sizes of spines + *Productus*, a generic name  
Galeatella: helmet + diminutive  
Hyborhynchella: humpbacked + beak + diminutive  
Laminatia: a thin plate  
Leioproductus: smooth + generic name  
Limnoscelsis: marsh or pond + *skelis* = rib (or *skelos* = leg)  
Ophiacodon: serpent + tooth  
Planoproductus: flat + generic name  
Platyhystrix: flat, broad + spine  
Porostictia: pore + in a row  
Periptychus: around + fold or ridge  
Ptilodus: feather or plume + tooth  
Sentosia: a briar, full of thorns  
Sphenacodon: wedge + point or barb + tooth  
Strophopleura: twisted + rib  
Syringospira: pipe + coil or spire  
Taeniolabis: ribbon or band + a pair of forceps, a clasp

In 1877 Meek described a new species of ammonoid, *Goniatites gonilobus*. The name *Goniatites*, proposed in 1825, had reference to the angular sutures of the shell (*gonia*, angle + *ites*, suggesting the fossil nature of the animal). The name *gonilobus* means "having angular lobes." Later, Meek's species was chosen as the type for a new genus, *Gonioloboceras*, by Hyatt (1900). This name was derived from *gonilobus* + *keras*, horn, and thus means literally a horn having angular lobes. The species now stands as *Gonioloboceras gonilobum* (Meek).

Examples of quite a few specific names are given below. The significance of some of them will be apparent but the derivations of most are indicated.

aberrans  
admirabilis  
alticuspis: having high cusps  
angulata  
angusticameratum: having  
narrow chambers  
angustidens: narrow-toothed  
angustus: straight, narrow  
anomalotruncata  
antiquus

apicalis: sharp-pointed  
apiculatus: having a pointed termination  
astutus: adroit, clever  
bellula: very beautiful  
bicarinata: two-keeled  
bipartitus: two-parted  
breviposticus: made short behind  
brevis  
buceros: ox-horned  
bulbosus

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canna: a reed  
 carinatus: keeled  
 cavernosa: full of hollows  
 coccinarum: berry-like  
 collinum: hilly  
 communis: common, living in a society  
 contractus  
 corrugatus: wrinkled  
 crassa: thick  
 crenulata  
 crustula: a small shell  
 cuspidatus: pointed  
 deformis  
 devexa: sloping  
 diffusa: extended, diffused  
 discoidale  
 distans: separated, remote, standing apart  
 dolichognathus: long-jawed  
 elliptica  
 elongata  
 explanata: spread out, made plain  
 famula: servant  
 ferocior, ferox: fierce, hardy  
 fissidens: split-toothed  
 flagrans: ?  
 frugivorum: feeding on fruit  
 galeata: helmeted  
 gigantea, um  
 glabraventra: having a smooth or bare venter  
 grandis: large, full  
 horridus: rough, bristly, prickly, shaggy  
 inaequalis  
 inornata: unadorned, plain  
 insidiosus  
 insolita: rare, unusual  
 inspeciosus: not handsome  
 intermedia  
 interruptus  
 inversus  
 irregularis  
 juncea: like a bullrush  
 laminata  
 laqueata: arched, vaulted, fluted  
 latifolia: broad-leaved  
 lativertibralis: widely jointed or articulated  
 latus: broad, wide  
 lentus: flexible, pliant, sluggish  
 lineatus: drawn out or straightened  
 lineolatum: fine-lined  
 longicollis: long-ridged  
 longispinus  
 majusculus: somewhat older or larger

manticula: a little wallet  
 minimus: the smallest, least  
 minor: less, smaller  
 minusculum: rather less, trifling  
 mirus: wonderful, astonishing  
 modesta  
 multicuspis: many-pointed  
 multidentatus: many-toothed  
 multilineatum: many-lined  
 multiplicata: many-folded or ridged  
 multiseptum: having many walls  
 neglectus: overlooked (probably by some  
     other paleontologist)  
 nodomarginatum: knotty-margined  
 nodosus: full of knots or knobs  
 notabilis  
 nupera: late or recent  
 obliqua, us  
 obliquicostatum: obliquely ribbed  
 obtusidens: blunt-toothed  
 omnivorus  
 ovale  
 palmatus: palm-like or hand-like  
 paludis: marsh, swamp, pond  
 parva: small, short, narrow  
 paucireticulatum: slightly netted  
 pelagia: belonging to the sea  
 percostata: strongly ribbed  
 percrassus: very thick, solid, dense  
 perizomata: girdled, banded  
 perplexus  
 planocostata: flat-ribbed  
 planus: even, level, flat  
 platynota: having a flat back or ridge  
 plicatus: folded, plaited  
 poculum: a cup, bowl, or goblet  
 praecedens: going before or surpassing  
 praecursor: herald, forerunner  
 pretiosum: precious, valuable  
 primaevus: youthful, primeval  
 priscus: ancient, old, primitive  
 productus: drawn out, produced  
 proxima: nearest, next  
 pusilla: very small, petty, weak  
 putilla: dwarf or child  
 quadratus  
 radians: radiating, glittering  
 radulus: a scraper or rasp  
 rarus: rare, thin, scattered  
 reticulata: net-like  
 rhomboides  
 robustus

rotundatum	subtrigonus
rugosus: wrinkled, shriveled	sulcatus: furrowed
saliens: leaping, bounding, jumping;	temeraria: accidental, casual
prominent, conspicuous	teres: tapering, rounded off, smooth, elegant
sauridens: having reptilian teeth	transversa: wider than long
saurognathus: reptile-jawed	triangulata
scalper: a lancet	tricastatus: three-ribbed
scolopax: snipe, woodcock	triplex: threefold
sectorius: divided, sectored	triplicatus: three-plaited
serratus: saw-toothed	triserialis: in three series
simplex	truncatus
singularis	turgidus: swollen, inflated
sobrina: a cousin	tuta: safe, secure, examined
solitaria	umbrosus: shaded
sphenops: wedge-faced or wedge-shaped	ursinus: bear-like
spicata: having ears or spikes	variabile
spinosus: full of thorns, prickly	varispinosus
striatus	verruculiferus: warty
subcostatus: somewhat ribbed	vulgaris: common, coarse, inelegant
sublaevis: somewhat smooth	xenos: a stranger or foreigner
subquadrata, us	

## RESUME OF THE FOSSIL RECORD

### Statistical Summary

For a number of years I have been attempting, in at times a rather desultory fashion, to keep a census of New Mexico fossils as they are cited, described, and/or illustrated in the literature. In this work I have been assisted by a number of undergraduate and graduate students. For example, in her unpublished master's thesis, *A bibliographic index of fossils from New Mexico which have been described and/or illustrated in the geologic literature*, Leslie Murphey (1940) listed a total of 413 genera and 855 species. Not unnaturally, she overlooked a number of publications, and many species have been added since 1940. In 1955, for a graduate problems course, Mary S. LaPaz compiled a card catalog of several hundred Pennsylvanian invertebrate fossils cited or described in twenty-five publications. Both of these compilations proved to be of great assistance to me.

The statistical summaries that follow deal with species only, not genera, and cover the Paleozoic, Mesozoic, and early Cenozoic. For a number of reasons, chiefly lack of time, the later Cenozoic record is not included. A total of more than 3,380 species have been cited from New Mexico strata.

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A biologic listing is as follows:

	No. of Species
Vertebrates, chiefly land and fresh water	361+
Plants, chiefly land	549+
Invertebrates, chiefly marine	2,470+
Total	3,380+

A stratigraphic grouping by eras is as follows:

Era	No. of Species
Early Cenozoic *	443+
Mesozoic	934+
Paleozoic	2,003+
Total	3,380+

\*Includes Paleocene and Eocene only.

More detailed is the following table:

Era	Plants	Invertebrates	Vertebrates
Early Cenozoic	186+	(several)	257+
Mesozoic	268+	601+	65+
Paleozoic	95+	1,869+	39+
Total	549+	2,470+	361+

Even greater detail is to be found in the accompanying table.

The system yielding the largest number of different species of plants and animals combined is the Cretaceous; the Pennsylvanian is second; the Mississippian is third. But when the Cenozoic roster is completed, this era will certainly surpass the Mississippian system and may even surpass the Pennsylvanian. The poorest record by far of the abundant life that must have inhabited New Mexico is that of the Jurassic. The Cambrian and Triassic records likewise are deficient.

The greatest diversity of trilobites is found in the Ordovician; of corals, brachiopods, and crinoids, in the Mississippian; of forams, bryozoans, and ostracods, in the Pennsylvanian; of amphibians, in the Permian; of pelecypods, gastropods, cephalopods, and land plants, in the Cretaceous; of reptiles and mammals, in the Early Cenozoic.

#### Precambrian (3,600+ to 550 million years ago)

Fossils, notably remains of calcareous algae, have been found in the Precambrian rocks of several continents and in several of the states including Arizona and Texas. In 1960 R. L. Harbour reported that he had found *Collenia frequens* in the Castner limestone near the southeast base of North Franklin Mountain, north of El Paso and not far from the New Mexico-Texas line. No one has yet succeeded in discovering fossils in the Precambrian of New Mexico.

## NUMBER OF SPECIES REPORTED FROM EACH SYSTEM IN NEW MEXICO THROUGH 1960

	Calcareous Algae	Land Plants	Forams	Sponges	Graptolites	Stromatoporoids	Corals	Bryozoans	Brachiopods	Pelecypods	Scaphopods	Gastropods	Cephalopods	Annelids
Early Cenozoic <sup>a</sup>	?	186+								<sup>b</sup>		<sup>b</sup>		
Cretaceous	2	249	14				5	2	4	305	1	124	123	3
Jurassic	1	<sup>b</sup>												
Triassic	1	15								1+		5		
Permian	1	20	57	1			3	7	40	50	4	85	30	
Pennsylvanian	5	60	118	1			34	41	157	85	4	87	34	3
Mississippian	1	3	6	1			57	33	202	8	1	22	7	
Devonian	?	1		1		1	20	15	133	8		10	8	3
Silurian	?					2	28	6	19	1		9	1	
Ordovician	4			7	1	5	18 <sup>c</sup> +	9	51	5		47	34	4
Cambrian					1				10					1
Total	15+	534+	195	11	2	8	165+	113	616	463+	10	389+	237	14

a. Includes Paleocene and Eocene only.

b. Several.

c. Does not include new genera and species by R. H. Flower (1961).

	Trilobites	Ostracods	Cystoids	Blastoids	Crinoids	Asteroids	Echinoids	Conodonts	Miscellaneous <sup>d</sup>	Fishes	Amphibians	Reptiles	Bird	Mammals	Total for System
Early Cenozoic <sup>a</sup>										9		71	1	176+	443+
Cretaceous		1			1	1	5		4	11		43		?	898
Jurassic		1								2		3			7+
Triassic		1								1	1	4+			29+
Permian	3	5					4	b	9	3	10	15			347+
Pennsylvanian	10	25			8		3	b	6	2+		?			683+
Mississippian	9	2		6	85	1	1	b	3	2					450
Devonian	2	2			3		2	b	8	7					224+
Silurian								?							66
Ordovician	13	4	1		1			e	11 <sup>c</sup> +						215+
Cambrian	6								?						18
Total	43	41	1	6	98	2	15	e	41+	37+	11	136+	1	176+	3,380+

a. Includes Paleocene and Eocene only.

b. Several.

c. Does not include new genera and species by R. H. Flower (1961).

d. Includes conularids, amphineurans, burrows and trails of unknown organisms, and Problematica other than conodonts.

e. Many, probably.

*Cambrian (500 to 480 million years ago) \**

As has been noted in text and as can be seen from Figure 2, New Mexico's oldest fossils are of Late Cambrian age, possibly 500 million years old. Our fossil record for this period is by far the poorest of any period of the Paleozoic era. Only a few species of marine brachiopods and trilobites have been collected, along with worm burrows and a single species of dendroid graptolite (see table, *Number of Species reported from each System in New Mexico through 1960*). At least two, and possibly three, different ages are suggested by these fossils. The animals were small in size, mostly less than an inch across. The graptolites, by the way, were discovered by University of New Mexico geology students while on a field trip in the Caballo Mountains with several faculty members in 1950—the first discovery of graptolites of any age in the state.

*Ordovician (480 to 420 million years ago)*

The Ordovician rocks have yielded a diversified fauna of more than 200 species of marine invertebrates and some of these species are represented by large numbers of individuals. Most diversified are the brachiopods (51 species), followed by gastropods (47), nautiloid cephalopods (34), corals (18+), trilobites (13), and so on. There are marked contrasts in the composition of the faunas. For example, in the Early Ordovician El Paso fauna brachiopods lead in number of species, followed by gastropods, nautiloids, trilobites, sponges, algae, an amphineuran, and a cystoid. In the Middle to Late Ordovician Montoya fauna, brachiopods again lead, but these are followed by corals, bryozoans, gastropods; then a few pelecypods, sponges, stromatoporoids, and trilobites; and an annelid, a nautiloid, and a crinoid. Nautiloids and gastropods, which are common in the El Paso, are relatively scarce in the Montoya; on the other hand, corals and bryozoans, which are common in the Montoya, are rare in the El Paso.

A striking feature of the Lower Ordovician Bat Cave formation in the Caballo Mountains is the presence of algal or stromatolitic bioherms (reefs), ranging up to 400 feet in diameter and exceeding 300 feet in height. In the Cable Canyon sandstone of the Caballo Mountains, Kelley and Silver (1952) found a gigantic siphuncle of an *Endoceras*, indicating that this individual nautiloid attained a length of 20-30 feet—one of the largest known anywhere in the world. Numerous conodonts have been identified but not yet published. I understand that the U.S. Geological Survey has identified 6 genera and 17 species from the El Paso strata of the Northern Franklin Mountains and 12 genera and 17 species from the Montoya strata. Thus, a total of 34 species of these problematical fossils should be added to the totals in the table.

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\*Time spans for this and succeeding periods apply to the New Mexico record. Thus they do not always agree with those given earlier for the entire geologic time table.



*Silurian (420 to 395 million years ago)*

The Silurian marine fauna is a meager one—only 66 species. It has 28 corals, 19 brachiopods, 9 gastropods, 6 bryozoans, and a few other groups. The Early Silurian fauna, found only near Alamogordo, includes brachiopods, corals, gastropods, bryozoans, a pelecypod, and a nautiloid. The Middle Silurian fauna, found in the Organ, San Andres, Florida, and Victorio Mountains, and in the Cooks Peak, Lake Valley, and Silver City areas, includes corals, gastropods, brachiopods, and stromatoporoids.

*Devonian (370 to 345 million years ago)*

The Devonian, by contrast, has yielded a total marine fauna of well over 200 species, many of which are represented by large numbers of individuals, which are generally much better preserved than those of preceding periods. Brachiopods constitute the most diversified group (133 species); there are 20 corals, 15 bryozoans, 10 gastropods, 8 pelecypods, 8 cephalopods, and numerous other classes of marine invertebrates. New Mexico's first vertebrates are seven species of fishes, known only by their teeth; two suborders of placoderms and two subclasses of chondrichthyans are represented. Our first possible trace of any land organism is microscopic spores, which probably came from a marine plant but conceivably may have come from a land plant. (Primitive land plants are known to occur in the Devonian of Arizona.)

Outcrops of the Sly Gap formation are restricted to the Sacramento, San Andres, Caballo, and Mud Springs Mountains. (The Mud Springs Mountains are near Truth or Consequences.) At Sly Gap, the type locality of the formation, near the north end of the San Andres Range, fossils are so extraordinarily abundant that Stevenson and Bowsheer were able to collect more than 5,000 specimens in five hours. Unfortunately, this locality is no longer accessible because it is part of the White Sands Missile Range. The Percha shale crops out over a much larger area than the Sly Gap in southwestern New Mexico. Like the Sly Gap, it is quite fossiliferous and there is good collecting in the San Andres, Hillsboro, and Silver City areas. Noteworthy is the fact that, although Sly Gap and Percha are both Late Devonian in age, not a single species is common to the two faunas.

*Mississippian (345 to 320 million years ago)*

Mississippian time was marked all over the world by a great profusion of crinoids or sea-lilies. At least 85 species have been found in New Mexico, and the submarine gardens made by these animals undoubtedly exhibited gorgeous colors. However, brachiopods far outnumber them in species, for at least 202 brachiopods have been identified. There are 57 corals, 33 bryozoans, 22 gastropods, 9 trilobites, 8 pelecypods, 7 nautiloids, 6 blastoids, and several other classes. This period gives us our first forams, first blastoids, first rare starfish, and first definite land plants. Among the plants are an ancestral

horsetail rush, *Asterocalamites scrobiculatus*, from the Magdalena mining district near Socorro; and a lycopod or scale-tree, *Lepidodendron obovatum*, and a horsetail, *Calamites*, from the Big Hatchet Mountains, Hidalgo County. The last two plants may actually be of Early Pennsylvanian, not Mississippian, age. The total fauna of 450 species is by far the largest yet for the Paleozoic and is exceeded only by that of the succeeding Pennsylvanian period.

Certain contrasts in the composition of the several faunas may be noted. For example, the Caballero fauna of 74 species comprises 55 brachiopods, 7 corals, 5 crinoids, 4 gastropods, and a few other things. The Lake Valley fauna, which exceeds 200 species, comprises 80 brachiopods, 78 crinoids, 17 corals, 16 bryozoans, and several other things. When completely studied the crinoids may well outnumber the brachiopods. The Middle Mississippian Arroyo Peñasco fauna, the first Paleozoic fauna of northern New Mexico, totals 51 species and comprises 23 brachiopods, 6 forams, 6 gastropods, 5 corals, 5 bryozoans, 3 pelecypods, and a few other things.

#### *Pennsylvanian (320 to 265 million years ago)*

The Pennsylvanian fauna and flora are by far the most diversified of any of the Paleozoic era—exceeded only by those of the Cretaceous. The Pennsylvanian total of 683+ species comprises 157 brachiopods, 118 forams, 87 gastropods, 85 pelecypods, 60 land plants (actually 32 plants + 28 spores), 41 bryozoans, 34 corals, 34 cephalopods, 25 ostracods, and several other classes. Furthermore, the Pennsylvanian may have a greater number of individuals than any other Paleozoic period. Some of the forams, especially of the family Fusulinidae, are represented by untold millions of individuals. Although most of these are not much larger than a grain of rice or wheat, they are so numerous and so diversified that M. L. Thompson, a micro-paleontologist who has specialized in their study, claims that within a few thousand feet of Pennsylvanian strata he can recognize a total of 80 stratigraphic zones.

Good collecting localities abound in many of the state's mountain ranges, from the Sacramento, San Andres, Organ, and Franklin Mountains in the south through the Caballo, Oscura, and Los Pinos in the center to the Manzano-Sandia, Nacimiento-Jemez, and Sangre de Cristo Mountains in the north. Brachiopods, fusulinids, bryozoans, and crinoids are especially abundant; calcareous algae, pelecypods, gastropods, corals (especially horn corals), and echinoids are common; other groups, such as sponges, worms, scaphopods, nautiloids, ostracods, trilobites, and shell-crushing shark teeth, are generally less common. Not yet reported, apparently, are such things as radiolarians, blastoids, asteroides, amphineurans, numerous kinds of crustaceans, insects, myriapods, scorpions, or eurypterids.

Most of these invertebrates are small in size. For example, many bryozoans, brachiopods, pelecypods, gastropods, etc. are less than an inch in

length. Much larger forms, however, are known. Discoidally enrolled snails (*Bellerophon*) at one locality in the upper Rio de las Vacas Valley of the Jemez Plateau exceed 3 inches in diameter. Brachiopods sometimes attain a length of 4 inches or more; clams like *Allorisma* exceed 5 inches in length. The largest bryozoan I have seen in New Mexico is one from the Jemez Springs area—a fan-shaped frond 9 inches across and 4 inches high. Colonies of *Syringopora*, the organ-pipe coral, attain a diameter of 9 inches and the heads of *Chaetetes*, another coral, exceed 12 inches. What proved to be the largest scaphopod of any age known in the world up to that time was found by Harvard students near Taos in 1938; fragments indicated a diameter of more than 1 inch and a length of 14 inches. This is more than twice as large as the largest living tusk shell. (Unfortunately for New Mexico prestige, a somewhat larger individual belonging to the same species, *Dentalium* (*Antalis*) *raymondi*, was found in Texas in 1956.)

To demonstrate differences between areas, the following table was prepared; note the contrast between the Jemez-Nacimiento Mountains and Sandia-Manzano Mountains areas. (Some age difference is reflected in that the strata of the former area have a greater range in age than those of the latter. See Northrop, 1961. Also, a master's thesis was devoted to ostracods in one area.)

NUMBER OF SPECIES IN PENNSYLVANIAN STRATA  
OF TWO AREAS IN NORTH-CENTRAL NEW MEXICO

Phylum or Class	Jemez-Nacimiento Mountains	Sandia-Manzano Mountains	Total Different
Plants	7	10	10
Foraminifera	40	16	47
Porifera	3	0	3
Anthozoa	11	16	24
Scyphozoa	0	1	1
Bryozoa	9	23	28
Brachiopoda	81	70	118
Pelecypoda	37	40	58
Gastropoda	26	22	40
Cephalopoda	6	4	10
Scaphopoda	1	1	2
Annelida	3	0	3
Trilobita	5	9	11
Ostracoda	?	21	21
Crinoidea	3	6	7
Echinoidea	1	1	1
Vertebrata	1	1	1
Total	227	241	385

Terrestrial plants, represented by molds and casts of leaves, stems, trunks, and "roots," by microscopic spores, by seeds, and by silicified wood, are present locally. There were ancestral horsetail rushes, *Calamites*; scale-trees

and seal-trees, *Lepidodendron* and *Sigillaria*; a variety of ferns and extinct seed-ferns; and cordaitaleans or ancestral conifers. Some of the wood shows well-preserved cell structure.

It is almost inconceivable that any trace of original color can be retained for several hundred million years. However, Brill (1952) noted traces of original color in Pennsylvanian fossils of north-central New Mexico. He found a dark red color preserved in the shells of two species of *Marginifera*, a genus of brachiopod. Also, in the Pecos area, pectinoid pelecypods "have broad bands of alternating light and dark color radiating from the beak." In *Streblochondria* sp., nine dark bands alternate with wider light bands; in *Acanthopecten carboniferus*, dark concentric growth lines are studded with dark spinous processes on a lighter background; and *Edmondia gibbosa* has a light surface speckled with minute dark spots arranged in rows radiating from the beak.

Paleopathology is the study of injury and disease among fossil plants and animals. Parasitism is one form of pathology and we may note that the oldest lesions of parasitism known among New Mexico fossils occur in the Pennsylvanian. Many years ago in the Jemez Springs area I found several crinoid stems that exhibit galls or swellings formed by the parasitic worm *Myzostomum*. This particular genus has 70 living species that are always parasitic on crinoids. It is intriguing to reflect that here we have clear evidence of parasitism in this state approximately 300 million years ago. Other Pennsylvanian fossils, such as brachiopods and gastropods, exhibit borings made by sponges and worms. Bryozoans often incrust other animals, both living and dead, such as brachiopods, crinoids, and other bryozoans but these are not examples of parasitism.

#### Permian (265 to 215 million years ago)

As noted in the discussion of physical history and rocks, marine strata of Permian age are found chiefly in central to southeastern New Mexico, whereas continental red beds occur in northern New Mexico.

The number of marine forms, chiefly invertebrates, totals about 300 species; there are 20 land plants, a few fresh-water fishes, 10 amphibians, and 15 reptiles. Judging by what has been found just over the line in West Texas, many species of marine invertebrates remain to be discovered in New Mexico. Among the marine forms, gastropods lead with 85 species; there are 57 forams; pelecypods run a close third with 50 species, followed by 40 brachiopods, 30 cephalopods (chiefly nautiloids), and several other classes. It was during this period that trilobites and a number of other classes became extinct, not only in New Mexico but all over the world.

Marine fossils are generally scarce north of latitude 35° but at Bluewater Lake in the Zuni Mountains is a notable occurrence of large invertebrates, such as brachiopods 2 inches long, pectinoid pelecypods 4 inches across, and

coiled nautiloids ranging from 4 to 10 inches in diameter. Near Tularosa northwest of Alamogordo the white shells of several species of productoid and other brachiopods in black limestone have a nacreous or pearly luster and make striking museum specimens.

Land plants include horsetails; seed-ferns such as *Callipteris*, *Gigantopteris*, and *Supaia*; the cycad, *Taeniopteris*; and ancestral conifers such as *Lebachia* and *Walchia*. Some of the wood was replaced by copper minerals, such as the dark gray copper sulfide, chalcocite, and this in turn was altered to the green and blue copper carbonates, malachite and azurite. In the Estey mining district in the Oscura Mountains, trunks, limbs, and leaves are replaced by "copper glance" (chalcocite). Mollusc shells are reported to be replaced by "erubescite" (copper-iron sulfide) and "melaconite" (copper oxide); these shells contained less copper but twice as much gold and silver as the wood replaced by copper glance.

Among the land vertebrates, amphibians and reptiles give us our first glimpse of the tetrapods. Notable collections of these have been made from the red beds (Abo or Cutler formation) of the Jemez-Chama area and have yielded a number of new genera and species. New species include *Ophiacodon navajovicus*, a fish-eating lizard-like reptile weighing 57 pounds; *Ophiacodon mirus*, 5 feet long, weighing 92 pounds; and *Edaphosaurus novomexicanus*, 8 feet long and weighing 139 pounds, a vegetarian fin-back or "ship lizard" with yardarm-like projections from the spines supporting its sail-like membrane. New genera include *Aerosaurus greenleeorum*, 3½ feet long and weighing 37 pounds, and *Nitosaurus jacksonorum*, which weighed 46 pounds. One reptile from Cobre Canyon, near Abiquiu, *Limnoscelis paludis*, 5 feet long, was not only a new species and a new genus, but a new family had to be established to receive the genus. *Sphenacodon ferox* proved to be a new species, a new genus, and a new family, *Sphenacodontidae*; in this case a new suborder, *Sphenacodontia*, had to be erected to receive the family. A larger species, *Sphenacodon ferocior*, was found at the old Spanish Queen copper mine near Jemez Springs; this lizard-like creature was 9 feet long and weighed 285 pounds—the most powerful carnivore of its day in New Mexico. Many of these fossils, it may be recalled, were obtained in the 1870's by that professional collector, David Baldwin, whose sole companion was a faithful burro which he used to pack in supplies and pack out the fossil bones. In a delightfully whimsical mood, Prof. Romer named a new genus and species of reptile, *Baldwinonus* [Baldwin + onus, ass] *trux*—"in memory of the labors of David Baldwin and his faithful burro in bringing this as well as many other fossil vertebrates out of the New Mexican wilds."

### Triassic (190 to 175 million years ago)

By contrast with the Permian, the Triassic has yielded only a few dozen species. It will be recalled that no seas covered New Mexico during this

period and the few fossils recovered are those of terrestrial plants and animals. Plants include horsetails (two new species were assigned by Fontaine in 1890 to the living genus *Equisetum* but later were transferred to *Neocalamites*), cycads, cordaitaleans, and especially conifers such as *Araucarioxylon arizonicum*—the tall tree of the Arizona Petrified Forest. Silicified logs of this ancestor of the modern monkey-puzzle tree are not uncommon from the Zuni-Fort Wingate area eastward to the vicinity of Tucumcari. In several mining districts important production of copper ore has come from wood replaced by copper minerals. In the Nacimiento Mountains mining district, logs 2 to 3 feet in diameter were found, one of them 60 feet long, that were almost wholly converted to chalcocite (copper sulfide).

From fresh-water stream and lake deposits have come an alga, a river clam (*Unio*), a few small snails, an ostracod, and a fish. There is also an amphibian, some semi-aquatic reptiles, and some dry-land reptiles. The amphibian *Eupelor*, formerly known as *Buettneria*, was one of the last of the giant labyrinthodonts or stereospondyls, with a massive, flat skull 2-3 feet in length on an animal 6-7 feet long. Except for the skull and shoulder girdle, the skeleton was composed largely of cartilage. The limbs and feet were ridiculously small and obviously inadequate for locomotion on land. A large slab with a remarkable concentration of superb skulls obtained near Lamy between Pecos and Cerrillos is on exhibit at the U.S. National Museum.

Teeth, bony armor plate, vertebrae, and a few skulls of phytosaurs have been found at several localities in the Chama country, in the Santa Rosa-Tucumcari country, and in Union County north of Clayton. Phytosaurs were crocodile-like animals, aggressive carnivores haunting rivers and swamps; some were as large as modern gavials, 25-30 feet long; a skull from Union County is 46 inches long and fragments suggest even larger skulls. Another reptilian type was *Typothorax*, a heavily armored pseudosuchian that frequented upland areas between the stream courses. This creature, possibly 20 feet long, lived in the Chama-Ghost ranch area north of Abiquiu. According to E. H. Colbert (1960), it had "broad, quadrangular plates completely covering the neck, the back and the tail, and . . . sharp spines forming a sort of protective armament along the sides of the body." It was apparently a plant-eater and needed protection from the carnivorous phytosaurs.

The primitive dinosaur *Coelophys* "was a rather fragile little animal, six feet or so in length and lightly built, so that in life it probably weighed no more than forty or fifty pounds." It was bipedal, the hind limbs being used for locomotion and the front legs, reduced in size, were used for grasping food. "The teeth, though small, were very sharp, and it is evident that this little dinosaur preyed upon small reptiles of various sorts. It was a quick, active little predator, viciously hunting its prey and keeping out of the way of larger reptiles by virtue of its agility and speed." (Colbert, 1948.)

Cope had described fragments of *Coelophysis* in 1887 and 1889 but he did not have the skull or jaws and little was known until the discovery by an American Museum of Natural History party in 1947 at Ghost ranch near Abiquiu of a remarkable deposit of complete specimens. According to Simpson (1948), "This layer proved to be sensationally rich, probably the most important discovery ever made in the American Triassic. A bed a foot or two thick was found to be jammed full of bones of the little dinosaurs, piled one on top of the other and crisscrossed in every direction. More surprising still, for such an accumulation, the great majority of the bones seem to be associated in virtually complete skeletons, articulated as in the living animals. The total number of skeletons in the deposit is unknown, but there are certainly dozens and possibly hundreds."

Jurassic (155 to 135 million years ago)

The brightly colored Jurassic strata, so well displayed along U.S. Highway 66 from Bluewater to Gallup, in the Jemez-Nacimiento-Chama area, and along the Canadian escarpment from near Las Vegas to Tucumcari, have yielded surprisingly few fossils. The only ones known for several years were pieces of wood (generally in an indifferent state of preservation), a possible fresh-water alga, a couple of fishes, and a brackish-water ostracod.\* In addition, a few scraps of undetermined bone had been noted. But, because the Morrison formation in Colorado, Utah, and Wyoming had proved to be so productive, some of us anticipated that it would not be long before a lucky discovery was made. As Colbert (1950) predicted: "There is every reason to suspect, however, that bones may be present and await only a diligent search to be revealed to the paleontological eye."

Our optimism was justified in 1953, when William Chenoweth, one of our graduate students, found scraps of radioactive bone at three localities west of Albuquerque: near Correo and Mesa Gigante, near Acoma, and near Grants.

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\*A few details of these discoveries in the New Mexico Jurassic are here recorded. Up to 1928 only a few undetermined bones had been noted. In 1929 fossil fish were found by L. D. Kessler, an oil geologist, in the Todilto limestone between Santa Rosa and Tucumcari; these were identified by H. E. Koerner (1930) as *Pholidophorus americanus*, originally described from the Black Hills of South Dakota. This is an advanced holostean, 3 to 5 inches long. In 1939 a University of New Mexico student, John R. Peters, found an alga at Todilto Park north of Gallup. In 1942 D. H. Dunkle identified a smaller fish, *Leptolepis schoewei*, about 2 inches long, from the Santa Rosa-Tucumcari area; this is a primitive teleost. In 1944 Wilpolt and Reeside collected tiny ostracods (less than a millimeter across) near Thoreau east of Fort Wingate which were described by Swain (1946) as *Metacypris todiltensis*. During the next few years the fish *Pholidophorus* turned up at other localities: Lamy, southeast of Santa Fe; Correo; and Acoma. Thus we know this species for a distance of 200 miles east-west across New Mexico.

The pieces he found were small but proved to be critical and diagnostic. Colbert recognized three characteristic genera of Morrison dinosaurs: the armor-plated *Stegosaurus* (known to attain a length of 20 feet and a height at the hips of 11 feet), the giant *Brontosaurus* (up to 67 feet long with a weight of 30 tons), and the largest of the Jurassic carnivores, *Allosaurus* (35 to 40 feet long). Of the last there were only a few small bones, such as the "distal end of the proximal phalanx of the 3d digit of the left manus [hand]," a claw, and a tail vertebra. But what Chenoweth found was enough to prove the existence of these remarkable animals, better known from complete skeletons in adjoining states.

#### Cretaceous (115 to 70 million years ago)

The Cretaceous has yielded our largest flora and fauna, about 900 species. Of this number about 130 have come from the Lower Cretaceous and 770 from the Upper. Most of the Lower Cretaceous fossils are marine invertebrates; pelecypods, such as clams, oysters, and scallops, predominate, with gastropods next, and ammonites not uncommon; forams, corals, brachiopods, echinoids, worms, and other classes are also present. Gastropods up to 18 inches across have been reported. In the continental sediments, fresh-water snails and clams occur. Logs up to 2 feet in diameter have been reported. An interesting fern, *Tempskya*, is being studied by C. B. Read.

The Upper Cretaceous marine fauna totals about 450 species. Clams and oysters lead with more than 200 species; there are more than 100 cephalopods, chiefly ammonites, and nearly 100 snails. A small slab in the Geology Museum collected by Kenneth D. Sharp near Seboyeta east of Mt. Taylor while working on his thesis bears several dozen cream-colored shells of the high-spined snail, *Turritella*, in a dark red matrix—one of the most striking slabs I have seen in the Cretaceous of New Mexico. Starfish are extremely rare, not only in New Mexico but throughout the entire Rocky Mountain region. Particular interest, therefore, attaches to a slab found by S. Eugene Buell in 1956 near Cabezon that bears the imprints of several baby starfish scarcely a half inch across.

Most of the Cretaceous invertebrates are much larger than those of the Paleozoic era. Oysters range up to 24 inches in length; some of the clams, broken into many fragments, were probably larger than this; and the spirally coiled ammonites, also generally broken, range up to 30 inches in diameter. A few unbroken shells of large ammonites have been collected. We have a fine shell of *Prionocyclus wyomingensis* with a diameter of 13 inches and a thickness of 4 inches from Mariana Lake, east of Gallup, and one of *Coilopoceras* with a diameter of 21 inches from the valley of the Rio Puerco, northwest of Albuquerque. (Recently an ammonite 16 inches in diameter and 6½ inches thick was found in the Puerco Valley by 7-year-old David E.



Thomas. At first I thought it was an undescribed genus and species but later I learned that it was a *Mantelliceras canitaurium*, described from Wyoming. The largest of the Wyoming types had a diameter of 11½ inches, so David's specimen was quite a bit larger.) In the marine strata occur shark teeth of two quite different types: sharp-pointed flesh-cutting and rounded shell-crushing teeth.

In Late Cretaceous time conditions were much more favorable in the Raton region for preservation of plants than of animals. Thus we have from this region an excellent fossil record of the diversified and luxuriant plant life but practically no record of the contemporary animals that must have been living there. On the other hand, during the same time span, conditions were more favorable in the San Juan Basin for preservation of animals than of plants. In the Raton region there was, according to Knowlton (1917):

" . . . a series of great low-lying swamps and marshes wherein grew much of the vegetation of the time. In the pools and slow-moving streams were *Sparganium*, and on the surface floated the rosettes of *Trapa? microphylla*. About the edges grew *Canna?*, *Acrostichum*, *Woodwardia*, and doubtless certain figs and an occasional palm. In the denser swamps were found the cypress-like *Cupressinoxylon*, *Widdringtonia*, *Sterculia*, and many species of *Ficus*, with here and there a breadfruit tree. On higher ground were sequoias, oaks, walnuts, laurels, ivies, and grapes.

"From the abundance and proportion of the plant types it may be presumed that there was an abundance of moisture, from the absence of marked growth rings that there was no sharp differentiation of seasons, and from the general facies of the whole flora that the climate was warm temperate and perhaps even subtropical."

In addition to the plants mentioned above, the following have been found in the Raton region:

algae	ebony	palm
ash	fern	plane-tree
bald cypress	fir	poplar
bayberry	fungus	spindle-tree
bean	honeysuckle	tulip-tree
buckthorn	jujube tree	willow

There are 14 species of ferns, 16 of figs, 8 of honeysuckle, and 5 of willow. Identified from the San Juan Basin are the following:

bayberry	fern	oak
bean	fig	palm
cattail	fir	plantain
currant	honeysuckle	sequoia
duckweed	horsetail rush	water-lily
ebony	jujube tree	willow
eucalyptus	laurel	

In addition to these records, based chiefly on leaves, Anderson (1960) has identified 71 species of pollen and spores in the Late Cretaceous of a small area near Cuba.

Silicified logs of large size with well-preserved cell structure are found in several places. In the Fruitland formation north of Chaco Canyon I have seen silicified logs more than 30 feet long compressed in the plastic shale to elliptical cross section a foot across and only 2-3 inches thick, yet with microscopic cell structure perfectly preserved. Edward C. Beaumont has seen trunks 120 feet long, broken into numerous segments, but with stumps and parts of roots attached. He tells me that some of the wood is silicified and some is coalified. In the valley of the Rio Puerco northwest of Albuquerque good specimens of silicified logs are occasionally found. Some of these are riddled with burrows made by *Teredo*, a boring pelecypod commonly known as the "shipworm." The logs were probably carried by river floods down to the sea, where the *Teredo* attacked them just as it does the piles of wharves and bottoms of wooden ships today.

In the continental sediments of rivers, deltas, lakes, and swamps occur fresh-water clams and snails, fishes, a few crocodiles, a variety of turtles (at least 16 species), and both herbivorous and carnivorous dinosaurs. In 1916, Stanton described and illustrated a new species of fresh-water snail from the Fruitland formation, *Neritina baueri*, well-preserved specimens of which retain "the color pattern, which consists of numerous irregular dark-brown spots and bands, some of which tend to have a spiral arrangement, while others run in zigzag fashion nearly parallel with the growth lines." He added that this snail, 1½ inches in diameter, is "much larger than any other American Cretaceous *Neritina* that has been described." Among the dinosaurs are the ornithopods, *Kritosaurus* with its Roman nose and *Parasaurolophus* with its long tubular crest; ceratopsians, like *Monoclonius* with its single very large nasal horn, and *Chasmosaurus* and *Pentaceratops*, each with three horns; sauropods, such as *Alamosaurus* and possibly *Camarasaurus*; and the carnivorous dinosaurs, *Gorgosaurus*, up to 29 feet in length, and possibly *Deinodon*, which was nearly as large as the famed *Tyrannosaurus* (not yet known from New Mexico).

#### *Paleocene (70 to 55 million years ago)*

With the general continental emergence of Late Cretaceous time the seas made their final retreat and marine life disappears from the New Mexico record. From now on we see only the plants and animals that lived in the fresh waters of streams, lakes, and swamps and on the dry land. The Cenozoic era saw the spectacular rise of the mammals to dominance, supplanting the dinosaurs and other great reptiles of the Mesozoic. From Paleocene strata numerous leaves, clams, snails, fish, reptiles such as crocodiles, turtles, lizards,

and snakes, and a great variety of mammals have been collected, studied, and named.

In northeastern New Mexico conditions during the Paleocene were more favorable for preservation of plants than of animals, as they had been during the Late Cretaceous. For the Raton formation Knowlton (1917) postulated:

" . . . a series of great swamps and marshes. . . . In the shallow open waters there were water lilies of the familiar types. In the marshes grew the tall, reedlike grass, *Phragmites*, and doubtless several of the small ferns. About the edges of the marshes were palms, figs, cinnamons, and breadfruit trees. In the denser swamps there were probably figs, magnolias, sweetgums, sycamores, and certain of the climbing vines. On higher and drier ground were oaks, walnuts, beeches, viburnums, and grapes.

"The presence of the numerous coal veins as well as the character and luxuriance of the vegetation indicates that moisture was abundant, and the known distribution of the living representatives of the Raton flora make it more than probable that the climate was at least warm temperate, perhaps not unlike that now prevailing in South Carolina and Georgia."

In addition to the plants enumerated above, there are the following:

bean	jujube tree	snakewort
buckthorn	laurel	soapberry
chestnut	linden	spindle-tree
dogbane	maple	spurge
dogwood	plum	stagger-bush
elm	poplar	sumac
euonymus	prickly ash	tragacanth
ginseng	senna	witch-hazel

There are 12 species of figs, 9 each of magnolias and walnuts, and 8 of plane-trees or sycamores. Single palm leaves as much as 9 feet across have been seen in the roofs of the coal mines!

In northwestern New Mexico there is much more known of animal life than of plant life. From the Puerco facies or formation we have a dozen species of dicots: breadfruit, buckthorn, fig, honeysuckle, magnolia, poplar, and sycamore. From the younger Torrejon strata we have ten species: breadfruit, buckthorn, fig, jujube tree, oak, sycamore, walnut, and witch-hazel. In addition to these leaves Anderson (1960) has identified 23 species of pollen and spores in a small area near Cuba.

The roster of Puerco animals includes a snail, a fish, a rhynchocephalian, 2 crocodiles, 16 turtles, and at least 42 mammals, including multituberculates, marsupials, taeniodonts, carnivores, condylarths, and amblypods. I would like to digress a bit into the realm of paleopathology and note that although bone fractures are known as far back as Permian time among reptiles from Texas, what appears to be the oldest known fracture among mammals is found in a New Mexico specimen. This was *Ectoconus*, a small

herbivorous ungulate or amblypod of the Puerco fauna. According to R. L. Moodie (1923), the unfortunate creature "had suffered a fracture of the left humerus immediately above the condyles and the ensuing infection resulted in the coalescence of the articular end of the humerus in the olecranal fossa. The fracture [became] badly infected for the whole lateral surface of the ulna is pitted with necrotic sinuses and roughened with carious bone . . . the injury must have seriously handicapped the individual but it survived the infection since the lesions are well healed over. This is the oldest known ankylosed elbow joint . . . " And so we take leave of little *Ectoconus*, as he painfully hobbles over the badlands (then a level flood plain) between Cuba and Bloomfield 67 million years ago.

The roster of Torrejon animals includes a clam, 6 snails, a fish, 3 rhynchocephalians, 2 crocodiles, 2 lizards, a snake (an ancestral viper), 17 turtles, and 53 mammals, including multituberculates, insectivores, taeniodonts, carnivores, condylarths, and amblypods. Digressing again, it may be noted that *spondylitis deformans* is an ancient disease, going back to Early Cretaceous dinosaurs and many examples are known among both reptiles and mammals including man. Here again, the earliest mammal exhibiting it is *Pantolambda*, an amblypod from the Torrejon of the San Juan Basin. *Spondylitis deformans* is a type of pathology around the articular surface of the vertebrae; it is the result of inflammation in the vertebral ligaments, caused either by infection or injury, and may cause complete rigidity of the spine.

An interesting bit of indirect evidence for the presence of ants as early as Paleocene time is a log exhibiting ant galleries found near the Cuba-Bloomfield highway. These were described and illustrated by C. T. Brues (1936); they are similar to the galleries made by living species of "carpenter ants" of the genus *Camponotus*.

#### Eocene (55 to 50 million years ago)

Silicified logs are not uncommon in the early Eocene strata of the San Juan Basin but apparently few leaves have been collected or identified. On the other hand, a fauna of possibly 120 species reveals abundant and diversified animal life. There are clams, snails, fishes (mostly garfish scales), crocodiles, lizards, a profusion of turtles (20 species), New Mexico's first bird (the giant *Diatryma*, 7 feet tall, with much reduced wings, massive legs, and a large head with a powerful beak), and about 80 mammals distributed among 23 families and 10 orders. There were 6 insectivores (representing 6 families), 19 creodonts, 5 fissipede carnivores, 15 condylarths, 14 amblypods, 5 taeniodonts, 3 tillodonts, a rodent, 5 primates (a tarsiod and 4 lemuroids), an artiodactyl, and 7 horses. The horses, *Hyracotherium* (formerly "*Eohippus*"),

about the size of a fox terrier, make an interesting contrast with the 7-foot *Diatryma*.

At the Sweet ranch near Cerrillos one tree 6 feet in diameter has an estimated length of 135 feet. A popular article on the petrified forest here reported a tree 4 feet in diameter and 185 feet long, which seems excessive.

As noted earlier, I have not attempted to carry my census of New Mexico plants and animals beyond the Eocene. However, some general aspects of the fossil record of the last 50 million years are presented below.

### *Oligocene (35 to 25 million years ago)*

No fossils of proved Oligocene age have come to my attention. A few titanotheres teeth from the Galisteo, at first reported to be early Oligocene in age, have been assigned to the Duchesnean or latest Eocene.

### *Miocene and Pliocene (25 to 1 million years ago)*

Opalized wood or wood-opal, much of it of gem quality, occurs at various localities in the Santa Fe formation of the Rio Grande Valley and Jornada del Muerto, notably near the north end of the Fra Cristobal Range north of the Caballo Mountains and south of San Marcial. Here stems, limbs, trunks, and roots in a variety of colors are well preserved. Opalized wood of *Fraxinus* (ash) with cell structure beautifully preserved occurs in abundance near the Bernardo bridge, about halfway between Los Lunas and Socorro; this was found by M. Howard Berliner in 1939.

From the Santa Fe formation of the Española basin north of Santa Fe a truly astonishing amount of material, most of it mammalian, has been collected. Literally, freight-car lots have been shipped to the American Museum of Natural History. The Childs Frick collection, started in 1924, includes giant tortoises,\* falcons or vultures, and many species of mammals: rodents (especially beavers), rabbit, cat, bear-dog, dog, rhinoceros, 3-toed horses, deer, pronghorns, camels, and 4-tusked mastodons (about shoulder high to a man.) The pronghorns or "antelopes" number about a dozen species and are represented by more than 1,500 skulls and jaws. Of several new genera and species of mastodon, my favorite is one found near Ojo Caliente and named *Ocalientinus ojocaliensis*!

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\*One of the prize exhibits of our Geology Museum is an Española tortoise, 34 inches long, 27 inches wide, 15 inches high, and weighing about 500 pounds. (This specimen was photographed for National Geographic Magazine in 1942.)

### *Pleistocene and Recent (the last million years)*

Some plants, some fresh-water clams and snails, and many vertebrates, especially mammals and birds, have been found widely scattered over the state, possibly in every one of the thirty-two counties. It was during the Pleistocene, of course, that many mammals attained their present stature, such as horse, camel, deer, and bison. The mammoth and mastodon stood higher than the surviving elephants; beaver, bear, and sloth were larger than their living relatives. Mammoth and/or mastodon have been reported from at least half of the state's counties. Horse, deer, and bison were widely distributed also.

Far more material, apparently, has been collected from the latest Pleistocene and Recent than from early or middle Pleistocene. A frustrating problem is where to draw the boundary between Pleistocene and Recent time. Formerly set at 25,000 years ago, this boundary is now generally placed at only 9,000 years ago. Purists have argued that plant and animal remains from the Recent epoch should not be termed fossil; some have used the term subfossil. Many Pleistocene species of plants and animals have survived to the present day. A number of species, such as mammoth, mastodon, horse, camel, bison, giant bear, and others, became extinct in latest Pleistocene or Recent time. A few lingered on until a few thousand years ago. The great ground sloth may have survived in New Mexico until a few hundred years ago.

Artifacts of prehistoric man associated with skeletal remains of numerous vertebrates were discovered at several localities in the state, notably in certain caves, during the period 1926-1940. Many papers by archeologists and paleontologists describing the excavations at these sites were published during the period 1929-1941. For example, artifacts associated with an extinct species of bison were found in 1926 near Folsom, 22 miles east of Raton; this came to be called the Folsom culture. In 1927-1928 Boy Scouts began exploring Sandia Cave. Conkling Cavern and Shelter Cave, at Bishop's Cap Peak near Las Cruces, as well as several caves in the Guadalupe Mountains west of Carlsbad, were explored by amateurs and archeologists. In 1932 a road construction crew, seeking gravel in Black Water Draw, between Clovis and Portales, found large quantities of bison bones and mammoth bones, tusk, and teeth along with artifacts.

A notable feature of Conkling and Shelter Caves was the large number of bird bones; a check list for those two caves and another in the Guadalupe Mountains reveals 65 different species of birds, of which only 4 are extinct. Included are the California condor, vulture, turkey, hawk, falcon, owl, etc. A new species of roadrunner was named *Geococcyx conklingi* for Roscoe P. Conkling after whom the cavern was named. One new genus of bird, *Pyelorrhamphus*, was described. From Conkling Cavern have come the following mammals: bison, camel, cave bear, coyote, ground sloth, horse, pronghorn

("antelope"), a large wolf, and other small carnivores and rodents.

The Burnet Cave in the Guadalupe west of Carlsbad yielded 2 reptiles, 17 birds, and 43 mammals. Many of these mammals are small in size, but there are large ones such as bison, camel, deer, horse, mountain lion, muskox, and pronghorn.

Clovis lake clays and associated river sands and gravels at Black Water Draw were excavated by E. B. Howard and associates, of the Academy of Natural Sciences of Philadelphia with the support of the Carnegie Institution in 1933. Various specialists reported on the diatom flora, the molluscs, the vertebrates, and the artifacts. Of diatoms, which are one-celled plants of microscopic size, there are 140 species. A clam, 20 species of snails, a box turtle, and the following mammals were identified: beaver, bison, camel, deer, horse, mammoth, peccary, prairie dog, skunk. The artifacts and associated flora and fauna are believed to be between 10,000 and 13,000 years old.

At the Folsom quarry more than fifty skeletons of an extinct species of bison, *Bison taylori*, were found with artifacts in a small area, suggesting a kill and barbecue. A radiocarbon dating of charcoal from this site gave an age of  $4,575 \pm 300$  years, which many workers think is too little.

At Sandia Cave near Placitas at the north end of the Sandia Mountains, where excavations were carried on by University of New Mexico students under the direction of Frank C. Hibben in 1936-1940, three age levels were found. The oldest or Sandia level, with its Sandia points, was dated by radiocarbon analysis of mammoth ivory as 26,000 years old and contains the following mammals: bison, camel, horse, mammoth, mastodon. The overlying Folsom layer, with its Folsom points, and believed to be about 8,000 to 9,000 years old, contains the following: bison, camel, ground sloth, horse, mammoth, wolf. The uppermost layer, less than 1,000 years old, contains: bat, bear, elk, ground sloth, mountain sheep, mule deer, porcupine, wood rat.

Another interesting cave not far from Albuquerque is Isleta Cave, 10 miles west of Isleta Pueblo. Here were found: bear, bison, camel, horse, lion, lynx, mammoth, pronghorn. Horse and mastodon have been found 9 feet below the surface in an arroyo at Placitas. Horse and mammoth occur in gravel pits within Albuquerque city limits. In 1956 J. Nicoll Durrie, Jr., then 9 years old, was hunting arrowheads high on the wooded east slope of the Sandia Mountains when he discovered remarkably well preserved mastodon teeth, now on exhibit in the Geology Museum. This occurrence at an elevation of 8,470 feet may constitute an altitude record for *Mastodon americanus*. This particular individual may well have died only 3,000-5,000 years ago.

A list (which I am sure is incomplete) of mammals so far reported from the Pleistocene and Recent sediments of New Mexico is given below.

badger	lobo wolf
bat	lynx
bear	mammoth (extinct)
beaver (extinct species)	marmot
bighorn sheep	mastodon (extinct)
bison (extinct)	mice
bobcat	mountain lion (cougar)
cacomistle (ringtail)	mountain sheep
camel (extinct)	mule deer
cave bear (extinct)	muskox (extinct)
cottontail rabbit	peccary
coyote	pocket gopher
deer (living and extinct)	porcupine
elk	prairie dog
ferret	pronghorn ("antelope")
fox	rat
giant bear (larger than a grizzly)	rock squirrel
ground sloth (extinct)	skunk
horse (extinct)	Virginia deer
jackrabbit	wolf
kangaroo rat	

One of the most exciting discoveries ever made in New Mexico was that of the partly mummified, completely articulated skeleton of the ground sloth *Nothrotherium shastense*. This specimen was found in 1928 by three adventurous lads from El Paso while exploring a volcanic pipe or fumarole 100 feet below the surface at Aden Crater, southwest of Las Cruces. This grotesque animal, 8 feet long and 3 feet high, with its curved talon-like claws 6 inches long, even had patches of hide and yellow hair. From an examination of the plants present in the associated coprolite (dung ball), it was possible to conclude that the creature had died in the spring of an unknown year, possibly only a few hundred years ago. Prof. Lull, of Yale, published a complete memoir of the Peabody Museum of Natural History (1929) on this single specimen.

### CONCLUSION

Huxley once wrote that what we have in the fossil record of the Earth "is but the skimmings of the pot of time."

What I have attempted to do in this paper is to dip into the New Mexico pot and ladle out a few plants and quite a few animals for your inspection. We have spanned 75,000 feet of sediments and about 500 million years of time and I have skimmed off only a few of the many thousands of plants and animals that have lived and died here in the salt waters of the seas, in the fresh waters of rivers, lakes, and swamps, and on the surface of the land, in underground caverns, and in the air. To avoid ending on a funereal note, let us recall with Alfred Noyes that

These rocks, these bones, these fossil ferns and shells,  
Shall yet be touched with beauty and reveal  
The secrets of the book of earth to man.



## SELECTED REFERENCES

Lack of space precludes appending a lengthy list of references. Quite a few references are made by citing simply the author's name and date. The interested reader can pursue these further by recourse to either of the following series of bibliographies:

Bibliographies of New Mexico geology and mineral technology, published by the New Mexico Bureau of Mines and Mineral Resources (Socorro, New Mexico) as Bulletins 43 (covering literature through 1950), 52 (1951-1955), and 74 (1956-1960).

Bibliographies of North American geology, published by the U. S. Geological Survey (Washington, D. C.) as Bulletins 746 (covering the period 1785-1918), 823 (1919-1928), 937 (1929-1939), 1049 (1940-1949), 985 (1950), 1025 (1951), 1035 (1952-1953), 1054 (1954), 1065 (1955), 1075 (1956), 1095 (1957), 1115 (1958), and 1145 (1959).

For unpublished theses and dissertations, see John and Halka Chronic, 1958, *Bibliography of theses in geology*, published by Petroleum Research Corp., Pruett Press, Inc., Boulder, Colorado.

## ADDENDUM

*Published and Unpublished Investigations*

A study of the available bibliographies published by the U. S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources shows that through 1960 about 5,000 articles, bulletins, monographs, and books by about 2,300 authors have dealt with some aspect of the geology of New Mexico. Of these 5,000 titles, about 1,600 may be regarded as stratigraphic and/or paleontologic in nature. In turn, of these 1,600 titles about 650 are chiefly paleontologic; in more than 200 of these, new genera and new species of fossil plants and animals are described and illustrated.

In addition to this impressive array of published work, much unpublished information on the geology of the state exists in the files of federal and state organizations, oil companies, mining companies, geology departments of educational institutions, and elsewhere. The wealth of information contained in masters' theses and doctoral dissertations is not generally known.

In 1960, a total of 116 universities and colleges in the United States offered the master's degree in geology; of these, 58 offered also the doctor's degree. Of these 116 institutions, at least 40 have sent graduate students into New Mexico to do research in the field of geology. During the period 1903-1960, these 40 schools awarded 299 advanced degrees—69 doctors' and 230 masters'—based on dissertations and theses dealing with some aspect of New Mexico geology. A few of the leading schools are listed below.

*Leading Institutions in Total Advanced Degrees  
Based on New Mexico Geology, 1903-1960*

University of New Mexico	72
Columbia University	31
Texas Technological College	29
University of Texas	22
New Mexico Institute of Mining and Technology	12
University of Arizona	12
University of Wisconsin	10
University of Illinois	9
Harvard University	8
California Institute of Technology	7

Separate tables follow for dissertations and theses.

*Leading Institutions for Doctoral Dissertations  
Based on New Mexico Geology, 1903-1960*

Columbia University	20
Harvard University	8
California Institute of Technology	6
University of Arizona	5
Johns Hopkins University	4
Stanford University	4
and 1 with 3	
5 with 2 each	
9 with 1 each	

*Leading Institutions for Masters' Theses  
Based on New Mexico Geology, 1913-1960*

University of New Mexico	72
Texas Technological College	29
University of Texas	19
New Mexico Institute of Mining and Technology	12
Columbia University	11
University of Wisconsin	10
University of Arizona	7
University of Illinois	7
University of Kansas	7
Northwestern University	6
and 3 with 5 each	
2 with 4 each	
2 with 3 each	
4 with 2 each	
13 with 1 each	

## NEW MEXICO'S FOSSIL RECORD

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The following table shows the number of theses and dissertations based on New Mexico geology each year from 1903 through 1960.

Year	Theses	Dissertations	Year	Theses	Dissertations
1903	0	1	1942	3	0
1911	0	1	1943	0	2
1913	1	1	1945	1	0
1915	0	1	1946	1	2
1921	2	0	1947	4	3
1923	1	0	1948	5	1
1924	3	0	1949	6	1
1927	0	1	1950	18	1
1929	0	1	1951	16	3
1931	2	0	1952	10	3
1932	4	1	1953	26	5
1933	1	1	1954	11	6
1935	2	2	1955	16	6
1936	2	2	1956	19	2
1938	4	2	1957	14	5
1939	2	0	1958	18	8
1940	2	0	1959	11	6
1941	5	0	1960	10	1
Total				230	69

Note the remarkable jump in 1950. During the 11-year period 1950-1960, 225 advanced degrees were conferred, contrasting with only 74 degrees for the preceding 47 years.

The University of New Mexico's first graduate, Douglas Johnson, who received his B. S. degree in 1901, received his Ph.D. from Columbia in 1903 with a dissertation entitled "The Geology of the Cerrillos Hills."

Many different aspects of New Mexico geology are treated in these dissertations and theses, as shown in the following table.

## CHIEF EMPHASIS OF DISSERTATIONS AND THESES

Field	Dissertations	Theses	Total
General geology, incl. geomorphology	12	57	69
Stratigraphy	18	48	66
Economic geology	12	19	31
Petrology and petrography	7	23	30
Sedimentation	2	28	30
Paleontology	6	22	28
Mineralogy	7	16	23
Structure	2	7	9
Geophysics	0	7	7
Ground Water	3	3	6
Total	69	230	299

Note that only 22 theses and 6 dissertations have dealt primarily with paleontology. However, 48 theses and 18 dissertations have dealt with stratigraphy, and thus a total of 70 theses and 24 dissertations have dealt in some measure with New Mexico fossils. Parts of some of these writings have been published but many remain relatively inaccessible or are available only in microfilm.

The lecture was accompanied by about 175 colored slides taken by Dr. Abraham Rosenzweig, of the U.N.M. Department of Geology, illustrating geologic maps and cross sections, paleogeographic maps showing former distribution of land and sea, and fossil plants, invertebrates, and vertebrates, together with reconstructions of some of them and restorations of seascapes and landscapes. Many of the photographs of fossils were taken from published illustrations but some were from masters' theses and some from specimens in the University of New Mexico Geology Museum. A number of striking illustrations in color were from *Prehistoric Animals*, by J. Augusta and Z. Burian, published originally in Czechoslovakia and later in London. Also, a number of fossil specimens were placed on exhibit in the lecture hall.

# A HISTORY OF PUBLIC HEALTH IN NEW MEXICO

by Myrtle Greenfield

**DURING** its early years of statehood, New Mexico—with a population of a half a million people—had no public health department. Deaths from tuberculosis, influenza, smallpox and other infectious diseases were numerous, and epidemics were frequent. Beginning in 1919, when the first state department of public health was established, a few dedicated people, despite financial handicaps, lack of proper facilities, and difficulties encountered in bringing treatment to isolated communities, labored diligently and successfully to improve health conditions in the state.

The problems encountered in instituting a New Mexico Department of Public Health are thoroughly documented and described in this book. Numerous charts, graphs and tables augment the text. Not only does the author present the basic facts of the state's public health history, but intersperses her account with rich detail concerning the establishment of a public health laboratory (which she directed from its inception until her retirement in 1956), and a bureau of vital statistics, maternal and child care services, programs in dental and mental health and public health nursing, and sanitation services.

Budgetary problems and legislative acts bearing on public health are discussed fully, and comprehensive appendixes present pertinent letters, legislative acts, lists of personnel, and biographical material.

The author, "a keen observer, capable of self-criticism, and an inexhaustible pioneer worker," gives insight to the personal sacrifices made by numerous medical officials, doctors, legislators, nurses and laboratory technicians in order to bring New Mexico's public health services up to modern standards.

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