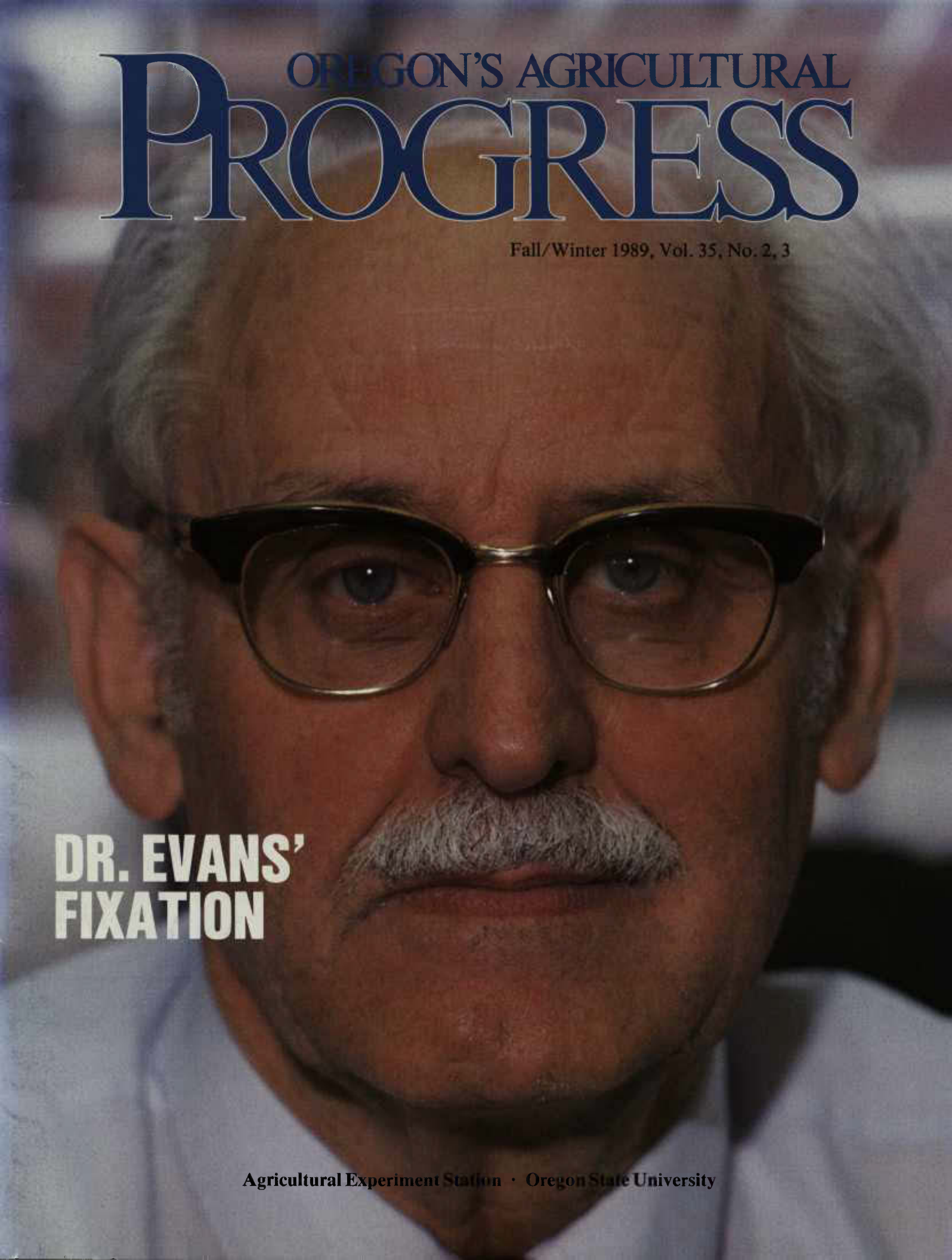

OREGON'S AGRICULTURAL PROGRESS

Fall/Winter 1989, Vol. 35, No. 2, 3

DR. EVANS' FIXATION

Agricultural Experiment Station · Oregon State University

THE EDITOR'S NOTE

The unspeakably wretched fact about tortoise sex.

If you want to know what it is, read the article in this issue containing entries from the journal wildlife ecologist Bruce Coblentz kept while he was working on a tropical island.

Many of Coblentz's insights into the tribulations of life on Aldabra Atoll are funny. But he also offers a grim view of a repair job he undertook after someone threw a monkeywrench into the island's fragile ecological machinery.

Another article examines decades of little-known contributions to the state made by Harold J. Evans, the recently retired director of OSU's Laboratory for Nitrogen Fixation. It's a story of individual effort by OSU's only member of the National Academy of Sciences. It's also the broader story of how basic research accumulates resources for the near, and not-so-near, future.

Elsewhere we learn about Experiment Station veterinary researchers' discovery that heartworms, long a problem for pet owners in other states, have slipped into Oregon. (My Dad lives down South and I remember when heartworms killed his dog "Klondike.")

There's also an article about a new Experiment Station study of "low-input, sustainable agriculture." That's part of the effort to conserve the state's precious natural resources, such as ground water and topsoil, while keeping the agriculture industry on the move.

—Andy Duncan

OREGON'S AGRICULTURAL
PROGRESS

Fall/Winter 1989, Vol. 35, No. 2, 3

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Cover:
Harold Evans has spent 40 years studying little nodules on plant roots. It may payoff big. See story, page 20. (Photo by Tom Gentle)

Page 2: A green sea turtle on Aldabra Atoll. Back cover: Sunset at Aldabra. (Photos by Bruce Coblentz)

POWERLINE ISN'T A SHOCK TO COWS

No injuries or damages showed up in a three-year Experiment Station study of livestock and crops living under the most powerful commercial direct current, or DC, electrical line in the United States.

That is the final report from Robert J. Raleigh, recently retired animal scientist at OSU's Eastern Oregon Agricultural Research Center at Burns (the study was featured on p. 6, Fall/ Winter 1985 *Oregon's Agricultural Progress).*

"Basically we found out you can raise cattle and crops under the power line without any adverse effects," said Raleigh, a former superintendent of the Burns experiment station.

Raleigh coordinated the research under a 500-kilovolt, direct current Bonneville Power Administration line. The line carries electricity from Bonneville Dam to the Los Angeles area.

It was the largest and longest study of its kind, said Raleigh. The study site was at Grizzly Mountain on the Crooked River National Grasslands 12 miles southeast of Madras.

An experimental herd of 100 cows, with calves during part of each year, lived in four corrals under the electrical line. A control group of cattle lived in identical corrals about a quarter of a mile away. Plant pathologist Fred Crowe, superintendent of the Central Oregon Experiment Station at Powell Butte, supervised the planting and study of alfalfa and wheat under the lines and in the control area.

"There were absolutely no problems in the cattle's conception rates, birth rates, weaning weights, calving intervals ... you name it," said Raleigh.

Cattle in one of the corrals at the Grizzly Mountain research site near Madras.

The yields and quality of crops raised under the line were similar to those of control group crops raised nearby, said Crowe.

The Bonneville Power Administration and nine other power systems in the United States and Canada contracted with OSU for the study. Most environmental research has been with high voltage alternating current, or AC, lines.

There are only a few high voltage DC transmission lines in the United States and Canada. But new technology has sparked interest in DC lines, Raleigh said.

One reason for the study was public concern about the construction of power lines. In the 1970s, people "shot up transformers and blew up towers" that were part of a direct current line built in Minnesota, Raleigh said. Also, lawsuits have blocked the construction of such lines.

THEY QUESTION SELENIUM SCARE

Two Agricultural Experiment Station researchers spent quite a bit of time recently telling Oregonians they don't have to worry about being poisoned by selenium, a trace element perhaps most well know in Oregon for its scarcity.

"It appeared to me there might be unnecessary worry about selenium toxicity in a state we have good reason to know is generally deficient in selenium," said Jim Oldfield, an animal scientist who's studied the substance for many years.

"I would just tell people to eat a balanced diet and don't worry about it," added Phil Whanger, a biochemist. Whanger has studied the selenium needs of pregnant women and is conducting federally funded research in China, sampling the blood of people in areas with medical problems caused by too much or too little selenium.

The concern over selenium started when Oregon publications ran an investigative report by a California newspaper, the Sacramento Bee. The newspaper said selenium had been found in food samples from supermarkets across the country at levels high enough to slowly poison millions of people.

The report said seven Western states have high selenium levels: Montana, South Dakota, Nebraska, Wyoming, Colorado, Nevada and Oregon. It said selenium that can cause problems can enter the food chain three ways: In grain grown in selenium-tainted soil, in livestock feed where selenium is added as a nutrition supplement, and when nutrition companies market selenium as a dietary supplement and multivitamin ingredient.

Rural families in areas with high selenium levels risk selenium poisoning when they eat only home-grown foods, said the newspaper, adding that the elderly, children and

sick and poorly nourished people are most susceptible.

Whanger questioned many of the newspaper's assertions.

"It appears they have taken little grains of evidence and stretched them a long, long way," he said. "Sure, selenium is toxic. But it's also an essential nutrient. It all depends on the levels of intake." Besides the vast majority of Oregonians eat foods produced in a wide variety of geographic areas, he said.

Oldfield was one of three OSU Agricultural Experiment Station scientists who in the 1950s discovered that a selenium deficiency was the cause of white muscle disease, a significant problem in livestock production in central and eastern Oregon.

He said the area around the Cascade Mountains is low in selenium and "the only part of Oregon I know of generally considered to be high in selenium is a little area of rock outcroppings west of Jordan Valley."

There are areas of the world where selenium toxicity is a problem, the OSU researchers pointed out. One is California's San Joaquin Valley, where selenium has been leached from some unusual, high-selenium rocks and concentrated on the valley floor in irrigation runoff water that drains into the Kesterson National Wildlife Reserve. Wildlife there accumulate toxic levels of the substance.

But "the situation at Kesterson is an unusual one and unlikely to be duplicated elsewhere," said Oldfield.

"The Bee has brought up some interesting things that need looking into," he said. "But as a researcher who has studied selenium in Oregon for 30 years, I want to assure Oregonians that changes in their dietary patterns don't seem to be warranted.

"I also want to assure livestock producers that supplementation procedures worked out over many years of studying white muscle disease in Oregon continue to be appropriate."

FISH EATS OATS, NOT OREGONIANS

It's safe to stick your toe in the Willamette River.

Two strange-looking, nine-inch fish that caused a media stir last summer when they were caught in lower Portland harbor weren't flesh-eating piranhas, as thought at the time.

"It's out of the same family but a different genus and species," said Doug Markle, an Experiment Station researcher in OSU's fisheries and wildlife department. "They've got the big-looking teeth but they use them primarily for eating seeds, not people, although they will eat just about anything.

"When we opened up its stomach it was full of wheat, oats, one earthworm and some crayfish, which means it probably was living in the Willamette and not brought in as a hoax like some people thought," Markle added.

This winter Jay Massey, a biologist for the Oregon Department of Fish and Wildlife, brought Markle one of the nine-inch fish and a couple of two-inch ones just like it. He wanted them identified.

"The two smaller fish were picked up ... by state police from a pet store owner in Portland," said Massey, who still had the larger fish from last summer. "Anything piranha-like is prohibited from sale in Oregon."

The fish's common name is Tambequi and like the piranha it is native to South America, said Markle.

In a way, it might be more dangerous in Oregon than a piranha.

"They probably wouldn't survive the winter here," said Markle. "But if they did it could be bad. This species will eat anything and gets huge in the Amazon area —up to a meter long and 75 pounds. They're fairly adaptable and might outcompete our other fish."

DAVE KING

The larger fish came from the Willamette River and the smaller one from a pet store owner in Portland.

FIVE NEW WILLOWS

Five new species of native Pacific Northwest willow trees are well on their way to nurseries, horticulturists, landscapers, wetland scientists and gardeners.

They are being propagated through the U.S. Department of Agriculture's Soil Conservation Service, the Oregon Agricultural Experiment Station and the experiment station at Washington State University. The willows, selected from the wild, were successful performers in growth and survival tests in moist environments.

All five are being recommended by the Soil Conservation Service for use in streambank stabilization, erosion control, and for streamside restoration. They also have potential for use in wildlife habitat and for natural-area landscaping.

The willows were selected for their ability to adapt to different environments such as streamsides, sloughs, beaches or reservoir drawdown zones.

Limited foundation stock for the trees are available to commercial nurseries, researchers, agricultural experiment stations and arboretums. Commercial quantities will be availble by January 1991.

For more information contact the USDA Soil Conservation Service Plant Materials Center, 3420 N.W. Granger Avenue, Corvallis, OR 97330 (503-757-4812).

Veterinary research in Oregon has revealed

A DANGEROUS ENEMY OF OUR BEST FRIEND

BY DAVID STAUTH

The worst-case scenario of a heartworm infection in dogs is almost like a heart attack in humans: sudden and possibly fatal.

A dog suffering from "vena cava syndrome" will have a rapid, severe onset of symptoms. It probably faces heart failure and death within 24 hours. By the time the infection has gone this far, emergency surgery is the only real option to save the life of the animal.

The dog, which literally has a cluster of worms clogging a main chamber of its heart, is often too sick to even withstand a general anesthesia. So under the effect of a local anesthetic, the veterinarian will make a small opening in the dog's jugular vein.

A special instrument is then used to slide through the vein towards the dog's heart. Reaching the heart, the instrument is used to grab the long, thin worms and pull them out of the animal's body. This procedure can be repeated, pulling out up to a dozen worms at a time, any one of which may be up to 12 inches long.

If the surgery is successful, the dog may later be treated with various medications and make a full recovery.

Heartworms do not always cause a life-or-death scenario like this. They can cause of wide range of health problems, and they're a fact of life that Oregon pet owners will have to come to grips with.

According to a new study by veterinary scientists at OSU, Oregon faces a potentially explosive epidemic of heartworms.

The dog ... literally has a cluster of worms clogging a main chamber.

The study found the parasitic disease in every region of the state. Tests indicate that 6-8 percent of the dogs tested were infected, according to the researchers. And, although the parasite more frequently infects dogs, it can also infect cats, horses and even humans, causing less severe disease symptoms.

The research results are a disconcerting and unwanted surprise for many veterinarians in Oregon who hoped heartworms were a problem they wouldn't have to worry about. But for Gary Zimmerman, a parasitologist, associate professor of veterinary medicine and Agricultural Experiment Station researcher at OSU, the findings were almost to be expected.

DAVE KING

Above: Heartworms reach lengths of up to 12 inches.
Right: Oregon dog lover Lynn Ketchum and friend.

DAVE KING

"I wasn't that surprised at the numbers we found," Zimmerman said. "I've been following the progression of heartworms as they moved across the United States, and it was apparent Oregon was about next in line."

Heartworms are a common disease problem in most other parts of the United States, particularly the Southeast and Gulf Coast states, where they date back at least to the 1800s. They're found around the Pacific Rim, in China, Mexico, and parts of Central and South America.

It can also infect cats, horses and evens humans.

They are carried and transmitted by mosquitoes. That explains, in part, why the disease spreads the way it does. Find a lot of mosquitoes, and you're more apt to find heartworm problems. From its original base in the lowlands and swamps of the Gulf Coast, the U.S. infestation moved up the Mississippi, Ohio and Missouri River valleys. It spread from there into the Midwest.

In the mid-1970s, the parasite was picking up speed in Kansas, where Zimmerman was a doctoral and veterinary student.

"I observed how heartworms got started in Kansas and then became endemic in the area," Zimmerman said. "They spread pretty rapidly. But when I came to Oregon, most of the vets thought there was no problem at all here. I couldn't quite believe that, from what I knew about the parasite."

Until the new OSU survey was completed in January, it was still widely believed that the Pacific Northwest was relatively free of this parasite. Because it was not supposed to be a problem for dogs in this area, veterinarians rarely even tested animals to see if it was present. But realizing the potential of the problem, they joined forces with OSU veterinary researchers to conduct the study.

The research findings are being used to inform the public, which is an important step—owners must realize their pets face a new and potentially serious health threat, Zimmerman said, before they can take the appropriate steps to deal with it.

Treatments are available for the problem, Zimmerman said. They can cost $200 or more and usually require brief hospitalization of the animal. An examination is first done to make sure the animal can withstand the treatment regimen, which includes some toxic medications.

After the parasite has been eliminated, preventive treatments are also available to ensure that the problem does not recur. Depending upon the size of the dog, they may range in cost from $25 to $50 a year, using different medications that can be given to an animal either daily or monthly.

The long, thin heartworms have an interesting life cycle. Following transmission by the mosquito, they grow inside the animal, in dogs usually taking up residence in the right side of the heart.

A dog can be infected "with anywhere from one to several hundred of these worms," Zimmerman said. Early symptoms include coughing, lethargy and sluggishness. More severe problems include liver, kidney and lung complications, congestive heart failure and death.

DAVE KING

Veterinary researcher Gary Zimmerman looks at a projected microscopic image of larvae found in a dog's blood. Mosquitoes pass the larvae, produced by adult heartworms, from dog to dog.

What form the disease takes depends largely on how severe the infection is within an animal, plus other variables, Zimmerman said.

The level of mosquito infestation is one variable. Heartworms do not multiply within an animal. They only grow to adulthood. So the numbers of mosquitos, and mosquito bites, influence the number of worms in a dog.

It will be six months or more from the time of first infection until the worms reach adultshood, and each worm can live for years. Different animals may have different resistance to infection. A small animal may suffer more from a comparable infection than a larger dog. An outdoor dog is far more likely to become infected than an indoor pet.

Early symptoms include coughing, lethargy and sluggishness.

"The bottom line is simply that we have proof this animal disease is here in Oregon, and all indications are that it will get worse," Zimmerman said. "The number of cases could double within 5-10 years, and pet owners need to consider this. They should get their animals checked and treated, if necessary."

Research assistant Donna Mulrooney does an antigen test used to diagnose heartworms.

DAVE KING

The disease probably came to Oregon, Zimmerman said, as one result of the increased mobility of Americans. He speculated that the heartworm has been in the state at low levels for a number of years, because the disease's latent "incubation period," which scientists still do not fully understand.

"Once this parasite is introduced to a new area, it apparently takes a period of time, maybe 10 or more years, for the dogs and mosquitoes to adapt to each other, and build up a reservoir of the infection," Zimmerman said. "But at that point the infection can really take off, and we may be at that point right now in Oregon."

At times in the South, the parasite has been found to infect up to 50 percent of the dogs and 10-15 percent of the cats, Zimmerman said. The problem could become that severe in Oregon in the future, he said.

Heartworms can even infect humans, although this phenomenon is fairly rare and there is no record of the parasites causing the same problems as in dogs. There have been instances in which small lesions were formed on a human lung, which in turn were misdiagnosed on X-rays as a malignancy.

The just-completed OSU survey analyzed 500 dogs from locations across the state. A new type of serologic analysis was used to identify the infection. It is more accurate than another type of blood test that is commonly used. At the same time, a written survey of veterinarians was conducted by Laura Richards, a senior veterinary student at OSU, in which doctors reported they were beginning to diagnose heartworms in some dogs.

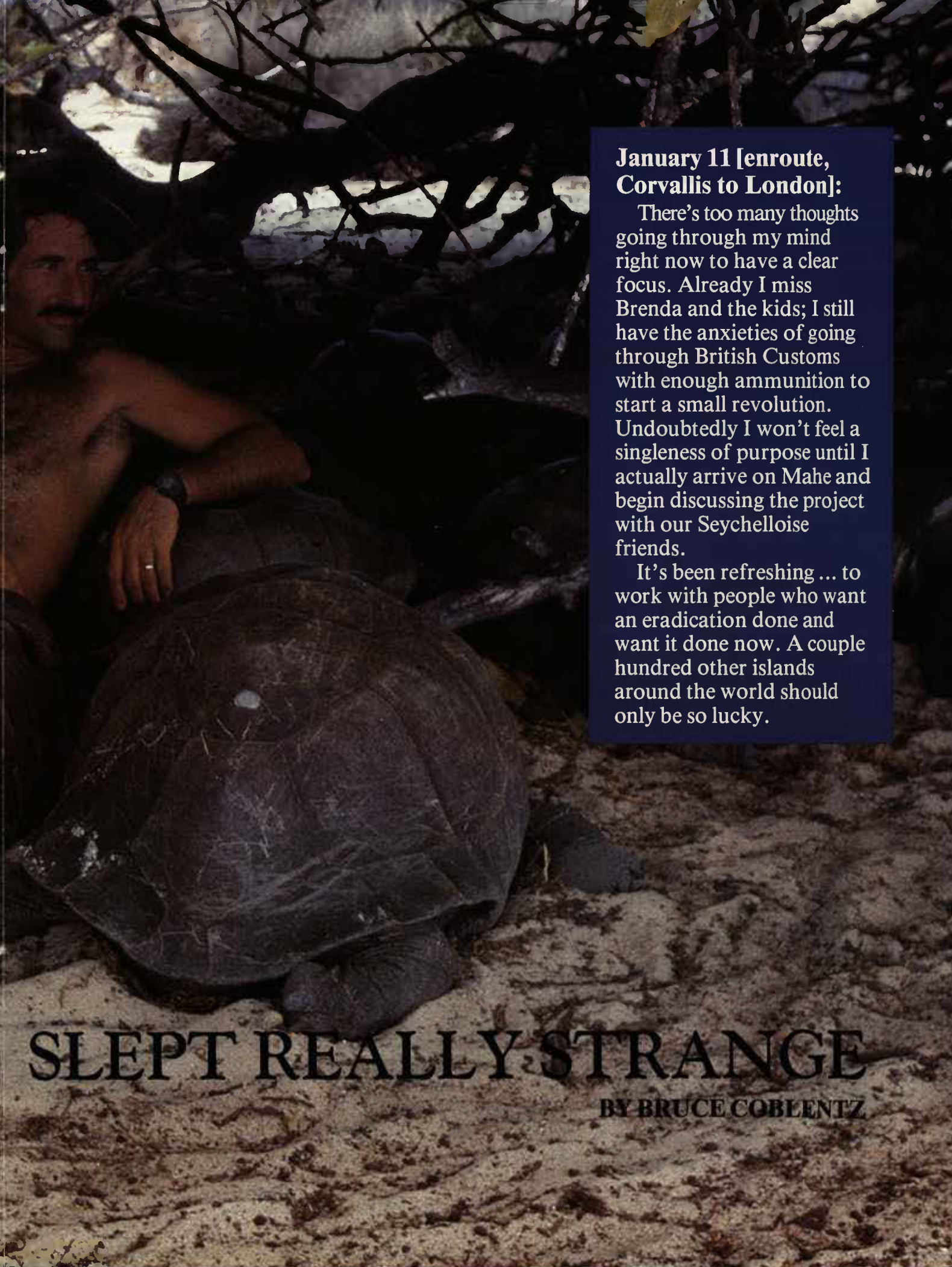
The surveys were the first of this type ever done in the state and information about their findings has been sent to veterinarians throughout Oregon. A nationwide heartworm awareness program will also begin soon. A drug company and the American Veterinary Medical Association are sponsoring the program.

According to Zimmerman, awareness is half the battle.

"Once you know you have this problem," he said, "it is something you can usually deal with. The real key is to make people realize they have a problem."

David Stauth is a science writer in OSU's Department of Information.


LAST NIGHT I



January 11 [enroute, Corvallis to London]:

There's too many thoughts going through my mind right now to have a clear focus. Already I miss Brenda and the kids; I still have the anxieties of going through British Customs with enough ammunition to start a small revolution. Undoubtedly I won't feel a singleness of purpose until I actually arrive on Mahe and begin discussing the project with our Seychelloise friends.

It's been refreshing ... to work with people who want an eradication done and want it done now. A couple hundred other islands around the world should only be so lucky.

SLEPT REALLY STRANGE

BY BRUCE COBLENTZ

As if not working when they are supposed to wasn't enough, about 9 p.m. a green turtle landed on the beach near the hut to lay eggs. Almost as soon as she started digging her body pit, one of our two non-workers jumped on her back and slapped the front edge of her shell. Naturally she then began crawling back for the ocean, forgetting about laying for one night anyway. I told him not to ever do that; I have no idea whether he understood.

January 30 [Dune Jean-Louis]:

This morning ... we went out looking for goats, but with very little success. Either there are fewer goats than reported, or they are using areas we are not expecting them to.

I've gotten a deep bruise on my left foot. It throbs and aches a little when we're going across the champignon [sharp coral rock]. It especially hurts as soon as we stop, and again in the morning when I get up. Certainly hope it's not a cracked bone.

The goats have an utterly devastating effect.

January 31:

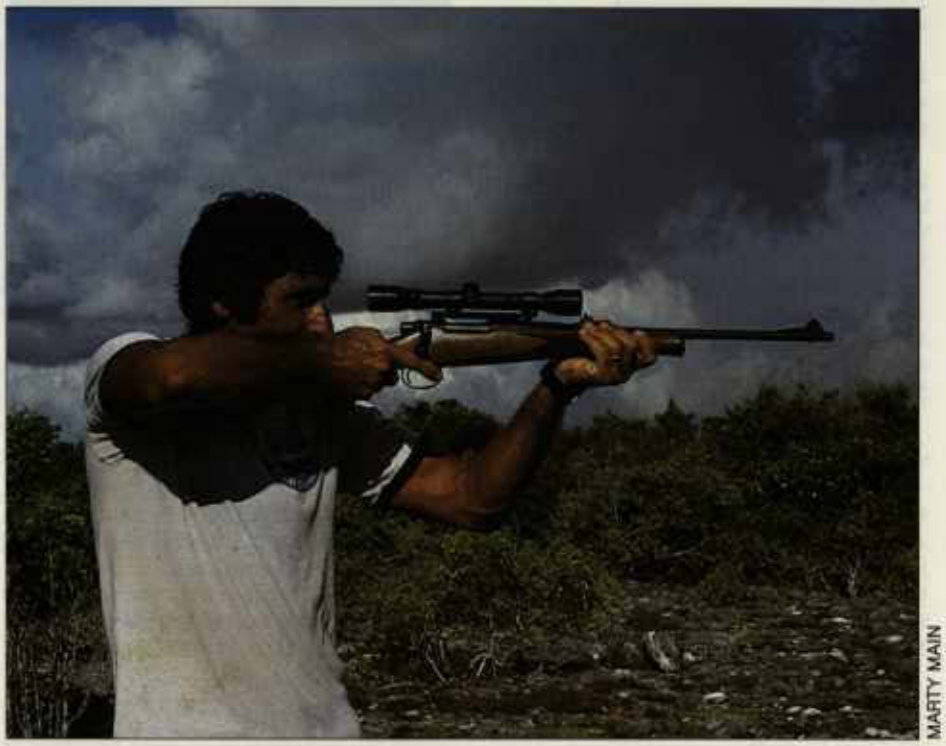
It's now been three weeks since we left Oregon. Seems like forever. Last night we had some cumulonimbus clouds passing over, the occasional rains forced us to dash around in the night and seek shelter. Marty and I set up our cots in the sleeping hut now used by the tortoises. It is interesting to think that our cots were atop many inches of pulverized, yet still aromatic, tortoise dung.

The workers can be amazingly cruel to tortoises. Several times today I have seen a tortoise thrown, beaten, and once even lassoed by the tail and dragged backwards, simply for blundering into tent ropes. It certainly isn't fitting for men working at a World Heritage Site.

February 2 [Main Station]:

After returning from Dune Jean-Louis and ruminating on what we saw, it is very clear in my mind that the goats have an utterly devastating effect on any habitat where they have lived for a considerable amount of time. At Dune Jean-Louis, the area frequented by goats was characterized by considerable openness and many dead woody plants. I am still at a loss to determine how so many ecologists could visit these places and not immediately deduce that the common denominator to the devastated areas is goats and not the tortoises, which are everywhere.

I went to Bassin cabri in the late afternoon and was treated to an entire [tortoise] courtship sequence leading to copulation in all its ponderous splendor. If they come out, I've got some great pictures in the camera.



MARTY MAIN

The choice is clearly between goats and Aldabra's natural ecosystem, contends Coblentz.

BRUCE COBLENTZ

Salting goat meat on the deck of the Scorpio.

February 3:

In retrospect, we are fortunate that we didn't go to Dune d'Messe today. At mid-morning Marty, Ramon Lawfock and I found a bunch of Picard goats just past Anse Var and we were able to kill six in fairly thick brush before the others got away. Almost all of these goats were dalmation coated; one male may be the largest goat I've seen on the atoll, yet he was quite young, only having his second molar. It appears that the Picard population is in the explosive, exponential growth phase of a low-density population in an unlimited environment.

Funny thing about being a parent. One becomes a worrier. Here I am over 600 miles from virtually anything, running after goats across champignon, firing guns at them, wading on tidal flats where sharks abound, where venomous stonefish sit waiting for prey, perfectly willing to let me step on them. Here I am with all this uncertainty swirling about me, and nightly I worry about Brenda and my little girls.

February 4:

12:20 p.m.: As I write this, I am sharing the shade of a large, spreading Bois cassant tree with about 50 Aldabra tortoises. We arrived at Dune d'Messe at about 11:30, at low tide. The landing was made easy by having taken two boats, a smaller faster one to make the run over the reef between breaking waves. Even so, one of the men split a lip when he hit some part of the boat as he was going down and the boat was coming up.

February 5 [Dune d'Messe]:

Harry and LeBrosse returned via the lagoon this morning and said that Franz's lips were split clear through .... It hasn't been closed, and they want me to go back to the station this afternoon to see if it can be stitched. They said water leaks out onto his chin when he drinks because the split lower lip extends down so far.

February 6:

10 a.m.: Harry and I returned to the station last night to try to help Franz .... Nobody had attempted to close it in any way and it looked terrible. I decided that stitches would not be good because much more than skin was involved, and it had been more than 30 hours since it happened. I used a series of surgical closures to hold it together. It looked good when we were done and got rid of the distorted look to his face.

When we were at the lagoon landing waiting for the tide to come up and float the boat, many jacks were actively feeding near the edge of the rising tide. I also saw three lemonsharks in this zone, none big, but nevertheless impressive enough. I hope to be able to get a jaw or two for the [OSU Department of Fish and Wildlife] museum.

February 8 [Dune Blanc]:

Last night about l a.m. it began raining. This time it seemed serious, so we went into the tents rather than just hunkering down in the sleeping bags until it passed. Wise decision. It turned into a continuous driving rain that didn't let up until nearly ll a.m.

Almost forgot—the other night the moon was full, and after a brief shower passed over, we saw a rainbow (yes, rainbow) by moonlight. I didn't think it was possible.

February 9:

As the tide began going out I saw a large (as in LARGE) shark cruising the flats in front of the station. It had to be 6 feet from the dorsal to the tail.

BRUCE COBLENTZ

These goats on Santa Catalina Island, off California, stripped the ground bare.

February 11:

Funny the things that pass through an inactive mind. I was wondering this morning if the Beaver basketball team was continuing its winning ways in the PAC-10, or whether they had another of their second half swoons .... Guess I won't know till March.

This morning I walked the beach near Passe Femme at dawn. There must have been a dozen reef blacktips [sharks] on the flats, and three sicklefin lemonsharks, one of which was 8 feet if an inch. As soon as the water on the flats got deep enough, they could no longer be seen (but I'm sure they were there; anybody for a swim?).

BRUCE COBLENTZ

Goats killed these trees on Aldabra, says Coblentz.

February 13:

We left the station on time this morning and travelled south so that the salted goat stored at Dune D'Messe and Dune Jean-Louis could be picked up. Our landing was smoother than usual except that Gilbert, the cook, lost his footing and went under. Marty hauled him up by the belt, but he had already lost one of his sandals and torn some significant pieces of skin off of his left knee. He's now the proud owner of another one of my bandages.

Their ... grunts are definitely X-rated.

February 14:

9 p.m.: We had a good hunt; we totalled 48 goats killed (actually 47 killed and one newborn taken live for Lawfock's son, if it lives). I had a fall on the champignon. So did Marty. So did Chanel. We all got cuts and bruises, but nothing worth worrying about.

The Ides of February [February 15]:

The baby goat we caught for Lawfock's son is starting to eat (on the Scorpio) and has adopted the Captain's quarters as its place. When it gets uncertain it heads for the Captain's legs and feels secure. I suspect it won't make it, but I hope it does.

Feburary 17 [Anse Cedres]:

We hunted inland this morning and got seven goats, all that were seen. We covered a ... lot of area, and I'm feeling confident that goat numbers are severely reduced wherever we've been hunting.

9:20 p.m.: The evening hunt was a success. We totalled 36, which includes two kids caught alive to go back on Scorpio (if they live). The one that went out a few days ago died today.

February l9:

During the night, one of the kids began bleating. First Marty called out to it—"Shut up." But that didn't work, cause the goat didn't understand English, and Marty didn't know how to say it in either Creole or goat. So he picked it up and put it next to his arm inside the sleeping bag. The goat was quiet and didn't move the rest of the night.

February 20:

Last night we fished for shark from the beach in front of the station. We caught a sicklefin lemonshark about 62 inches long, which was exactly what I wanted to get for the department's fish museum.

8:45 p.m.: Most of the workers have been drunk ever since we returned [to the station] and there appears to be little chance we'll get back to work tomorrow. Tomorrow morning I'll press Serge to ... sober up the workers and let us organize another trip into the field. I'd like to go to Gros Ilot on the lagoon side. There's supposed to be a lot of goats there.

February 21:

When adding powdered whole milk to tea here on Aldabra, the multitude of small ants rise to the top. Then you're confronted by a dilemma: Do you suck them off the top quickly so that the rest of your tea is a pleasant drink, or do you pick them all out with a spoon and stand out in the crowd?

February 22:

ll a.m. [Gros Ilot]: Left the Station this morning without a hitch. We are camped on the edge of the lagoon with very little shade and no hut. Since all our water had to be brought with us, we will only stay two days. If there are a lot of goats, and many remain, we'll simply return ....

BRUCE COBLENTZ

Indian Ocean giant tortoises mating.

8 p.m.: I feel privileged to be one of the relatively few people on this planet to have heard the full range of sounds that tortoises are capable of. Tonight we still-hunted at a bedground around a large pool and many tortoises were in the area. Breeding was in full swing, so there were tortoises copulating furiously (if that is an appropriate description of anything a tortoise does). Their ... grunts are definitely X-rated .... In addition they have a repertoire of gaseous stomach noises, coughs, wheezes, and an occasional loud hiss when disturbed.

February 23:

10:30 p.m.: The sky was real ominous tonight, so we loaded up the boat right after dinner and then sat in the boat until the tide came up and floated us. We just arrived back at the station minutes ago ....

February 24:

What a momentous decision it was to come back last night. It rained off and on all night long and then ended the pre-dawn hours with an hour-long downpour.

While sitting at Gros Ilot waiting for goats I had several tortoises in my view at all times. I watched one tortoise that walked from woody plant to woody plant, stripping every leaf, while ignoring all the grass and other herbaceous plants around it. I'm still amazed that the tortoise people insist that tortoises are grazers, goats browsers, and that the two do not compete appreciably for food. What were they watching while they were here?

Several hundred spinner porpoises ... seemed bent on entertaining us.

BRUCE COBLENTZ

A pair of fairy terns.

February 25:

We left for Middle Camp at 10:30 a.m.. Too bad there aren't more camps like this one. It is sheltered, large, and has good water. I almost forgot. With all the fresh fish that we caught on the way, guess what's for lunch? Absolutely right—salted grouper stomachs. I guess I'll just never understand.

5 p.m.: We walked the entire coastal area at Middle Camp and have gone through much of the interior area. We neither saw nor heard any goats, and careful ground searching failed to find a single pellet. While none of this is proof that last year's eradication was successful, it is pretty potent circumstantial evidence that there are no goats remaining in the Middle Camp area. In addition, there has been a dramatic improvement in the amount of vegetation in the area. At least in a subjective, ocular estimation, I am enthused.

February 26:

So I was wrong! This morning at dawn Harry Charles jumped from his cot and went outside the hut. He heard goats. I jumped into clothes, grabbed gun and bullets and started jogging the path to the coast. Five bullets, five goats.

February 27:

We saw no goats last night. Whether any remain is uncertain, but if there are any they are very few. Having gotten a male and four females yesterday would certainly stall any population recovery by a few years anyway. I did get some good tortoise-breeding pictures last night. Later we saw a white-throated rail family [rare flightless birds] ....

11 a.m.: While the tide was low Marty and I walked back into the mangroves, into the frigate colony. We got some good pictures of frigates and, unexpectedly, a pair of fairy terns.

February 28:

Yesterday afternoon I felt like an extra from "Night of the Living Dead." I was simply physically exhausted, probably a combination of lots of walking and then the rough boat ride ....

But the good news: La Belle Edmma, the boat that will pick us up, is scheduled to leave Mahe on March 5, which should put it here on the 8th or early 9th. If that schedule holds up there's a possibility that we will get home a week earlier. I could live with that. In fact, the aim now is to conceal how wonderful that prospect really is.

February 29:

The goats at Dune Blanc have gotten spooked by our shooting. They didn't show until dusk and we had to leave nine ... along the beach to be picked up tomorrow.

Part of the way back we stopped ... and our engine decided it wouldn't go back into forward. Great—now we'll drift for weeks on end in the Indian Ocean, right? LeBrosse fixed it with Roland's help and away we went into the night.

March 1:

Ah, sweet March. The month we return to family, friends and job.

7 p.m.: Today was the kind of afternoon that causes some of my colleagues to claim the work that I do is just an excuse to fish in various remote places .... In the space of four hours we caught two wahoo, two yellowfin tuna, two dogtooth tuna, two large jacks and one schooling barracuda. In addition, we were surrounded at one point by several hundred spinner porpoises that seemed bent on entertaining us with acrobatic leaps, flips, and spins.

MARTY MAIN

Coblentz with a tuna.

March 3:

I can foresee some real difficulties in making use of the time that we have left on Aldabra; we'll have to claw and scratch for every day in the field.

Today we got up early and hiked to Anse Var looking for the elusive Picard goats. We saw and heard nothing.

3:40 p.m.: This afternoon we got news of mixed feelings. La Belle Edmma is now scheduled to leave Mahe on the 9th rather than the 5th. The bad news is that this may be late enough that we might not be able to leave Mahe early and, therefore, London early. The plus side is that now we have been able to persuade Serge to plan for another trip to Cinq Cases. We'd like to reach 500 kills ....

It looked like some grizzly war.

Quite frankly, I'm weary of the lack of decision in carrying out our project, I'm weary of Gilbert's mediocre cooking, and I'm especially weary of being away from Brenda and my little girls. I just want to go home. Besides, I am physically getting drawn down, not due to lack of condition, but basically due to weight loss and mental fatigue.

Sharks cruise the flats near the research station.

BRUCE COBLENTZ

March 7:

6:45 a.m.: Last night we seemed to have caught up with a lot of individuals that had avoided us in two previous visits to Cinq Cases. Managed to get 42 goats, 34 of which were literally right on the coast. Total now 508.

We hung them on the rocks and it looked like some grizzly war had been fought, and lost, by the goats. I guess that's what happened.

March 8:

Total numbers are undeterminable, but there may be 200 goats left on the atoll. Too bad we didn't have better weather and better cooperation from the workers and boatmen. Those two together probably lost us a week to a week and a half's time. Nevertheless, we've done well.

This morning we leave for Picard. We'll hike to the lagoon and wait for enough water to pole our way out.

BRUCE COBLENTZ

A worker with dinner.

9:20 p.m.: Patrick was the first to wade in to put his things in the boat and almost lost a foot to a lemonshark that was in the murky pool where the boat was tied up. I saw the attack, and the shark's head slightly cleared the water just a fraction of a second after he jumped up into the boat ....

This evening we found out that the boat that is to get us is at Deroches [an island] tonight. It was supposed to leave Mahe tomorrow to come get us. Clearly that won't happen.

Well, there goes my hopes of seeing Brenda and the kids earlier than the planned dates. It's disappointing, I guess because it was a carrot dangled in front of me and then snatched away. I feel bad for those little girls who haven't had their Daddy for so long.

March 9:

I started trying to make sense of the data set this morning. 534 goats is a lot of data to play with. What I'm doing is just some of the basic stuff, trying to pull out such things as sex and age structure, reproductive rates, fetal sex ratios ....

Got a chance to play doctor again this morning. Sonny, the carpenter, cut the heel

It taste like the liner of an old jogging shoe.

of his hand clean through the muscle, and as usual runners were sent to find me to doctor him. I minimized his pain by only putting in three stitches but used heavy silk because of the location and the toughness of his skin. He didn't move. I was impressed. The other day one of the men cut his foot and Marty fortunately came into the library (where the medicine cabinet is) in time to prevent the guy from putting anti-diarrhea medicine on the cut.

I continued data summaries this afternoon. I should mention before I forget that one very major difference is apparent in the mangrove areas near Cinq Cases between last year and this year. Last year there were tortoises in this region everywhere, even in the very wet flooded areas, and we often found them clinging to mangrove logs and rocks at high tide. Dirk and I suspected that they were there because they were starving and were simply searching for food wherever it was. This year there were only a very few tortoises in this area. Although the vegetation doesn't seem to be different, I can't help wondering if the liquidation of nearly 300 goats in the population might have freed up resources inland that allowed tortoises to leave this untortoise-like habitat.

March 10:

This afternoon we snorkled on the outside of the reef at low tide. I probably saw nearly as many [fish] species today as I saw in a year in the Caribbean .... The highlight was a very large "flock" of bat rays, perhaps 40-50, that glided by us.

BRUCE COBLENTZ

A barracuda hovering outside Aldabra's reef.

Gilbert gave us a break from curry. He broiled wahoo steaks covered with garlic butter—only he served them luke warm and nearly raw. That poor guy can't seem to do anything right, but he still maintains that he is an international chef. He even screwed up the rice again tonight.

March 11:

Well, La Belle Edmma was to leave this AM, and it probably has, but we have also been told that it will first go to La Digue Oan island before proceeding to Aldabra. That should get it here sometime Monday night which would mean that it wouldn't unload (and load) until the following morning. That will get us out of here on the 15th, which is starting to cut things close.

BRUCE COBLENTZ

The tortoises, grazing here, need shade to survive the scorching midday heat.

Last night another batch of their coconut home brew must have matured because Roland appeared at our cabin at midnight calling my name and wanting assurances that I would help him get certification as a cook.

Last night's dinner was one of the worst we've had. It was salted goat, which we've had before and liked, but somehow Gilbert made it taste like the liner of an old jogging shoe worn incessantly by a person with terminal athlete's foot.

March 13:

We're ... getting a little bored, even a little disgusted, with Gilbert's cooking. Yesterday he managed to considerably undercook red snapper for two different meals. Thank God for strong spices.

It looks as if La Belle Edmma will arrive Monday night (tomorrow), load on the high tide the following morning, and then we'll be on our way. We would then figure on arriving on Mahe midday of the 18th (Friday). We'll see if that's the way it works out.

6:40 p.m.: Almost out of here. We went for one last hunt at Anse Var before packing up the guns tonight and lucked out by getting one of the elusive Picard goats.

March 14:

Activity is reaching a fever pitch around here as everything needs to be packed up to be shipped back to Mahe. We're still expecting La Belle Edmma this evening, but neither we nor Bon Espoir has heard from them so we don't really know their position.

The Ides of March (March 15):

La Belle Edmma arrived at dawn this morning, coming from the south. Of course we were all looking to the North and it was almost upon us before we knew it was here.

Onward, La Belle Edmma!

A VITAL LINK

After 40 years of basic research into nitrogen fixation, Harold Evans is leaving a treasure of information and a living legacy, his students

BY CAROL SAVONEN

Mention the term nitrogen fixation to most people and their eyes would glaze over.

Yet we are all dependent on this little-understood process. Without it, all life on earth would slowly disappear. And if it weren't for Harold J. Evans, the world would know a lot less about this vital link in the web of life.

Evans retired from OSU in January and is winding down a 40-year career that has brought international acclaim for his research on the process by which gaseous nitrogen from the air is "fixed," or converted, most commonly by bacteria called rhizobia, into compounds plants use to grow.

As an Agricultural Experiment Station scientist the last 27 years, he has accomplished as much as some teams of scientists. He is the only OSU faculty member ever to be elected to the prestigious National Academy of Science. He has trained more than 60 graduate and post-doctoral level scientists. Many of them are world leaders in plant physiology.

Evans also has received uninterrupted funding from the National Science Foundation for the last 32 years, a rare accomplishment. He was the founder of OSU's Laboratory for Nitrogen Fixation. He's received numerous national and international research awards, and he's published more than 200 scientific papers.

How'd he do it?

TOM GENTLE

Left: This gassing device he built helps plant physiologist Harold Evans study chemical reactions.

"You have to work on something that is exciting and interesting to you and also important to society," said Evans. "It's what kept me going. A lot of science is just hard work, so you need to find an interesting problem and make progress. And if you make progress in science, you can continue to be excited about it. It's kind of self-propelling."

"Legumes fix $69 million worth of nitrogen."

When trying to convey the complexities of the nitrogen fixation process, Evans makes allusions to an intricate piece of machinery. He looks upon his role as that of a mechanic.

"Why study nitrogen fixation?" he asked. "Well, if you understand the working mechanism of a process, you are in a position to diagnose a problem and repair it when something goes wrong.

"In Oregon, for example, legumes fix $69 million worth of nitrogen on private cultivated lands each year. Somebody should understand the machinery responsible for that. If we can understand it, we can take care of it—it's very complex machinery," he added.

Evans' basic research goal has been to understand the processes that enable legume plants such as peas, alfalfa, clover and soybeans to obtain their nitrogen needs from the atmosphere through nodules on their roots filled with nitrogen-fixing bacteria. With painstaking and increasingly sophisticated techniques, he and colleagues have discovered many of the basic biochemical and genetic intricacies of this nitrogen fixing "machinery."

In 1962, a year after he arrived at OSU, Evans discovered the first evidence that cobalt is essential for the growth of nitrogen-fixing bacteria and legume crops. About ten years later he found that legumes also need nickel, another trace element. Now that there is a known requirement for these trace elements in leguminous crops, agricultural production of legumes can be improved in cobalt and nickel-deficient areas.

But he didn't stop with determining the mineral requirements of plants. "We then wanted to investigate why these mineral requirements were important," he explained.

In the late 1960's, Evans and colleagues were the first to isolate and describe enzymes responsible for nitrogen fixation. This work made it possible to carry out the legume nitrogen-fixing process in a test tube, rather than in the plant root nodules, enabling plant physiologists to more thoroughly analyze the nitrogen fixation process in the lab.

Then, about five years ago, at a time in his career when most prominent scientists hang up their lab coats and become administrators or figureheads, Evans dove into molecular genetics and molecular biology, two disciplines that send shivers up the spines of all but the best and the brightest scientists.

"As a researcher, you have to continually keep a good part of the old and you also have to keep up with the new. Older faculty members have to get with it," Evans quipped.

He and co-workers had already found that some nitrogen-fixing bacteria were more energy-efficient than others and they wanted to know why. They identified the genetic material responsible, cloned it, and were able to transfer it to other bacterial cells.

"I see molecular biology and molecular genetics becoming a very powerful force," said Evans. "As far as plant science is concerned, it's just opening up.

"There's great opportunity for important contributions for manipulating the genetic constitution of plants by transferring genes from one plant to another, sorting out how they work, then improving plants," he said.

"If we could gentically transfer this ability to fix nitrogen with greater efficiency to other, less efficient crops, yields might be increased. This would have a very big impact," he added.

"But to transfer this nitrogen-fixing ability into a crop like wheat that doesn't fix nitrogen would be incredibly complex. It's not going to happen right away," he said.

"But we are gaining information at a rapid rate. There's hope, but it's not just around the corner. If we don't study these processes such as physiology and genetics, there will be no hope for doing something like this," he added.

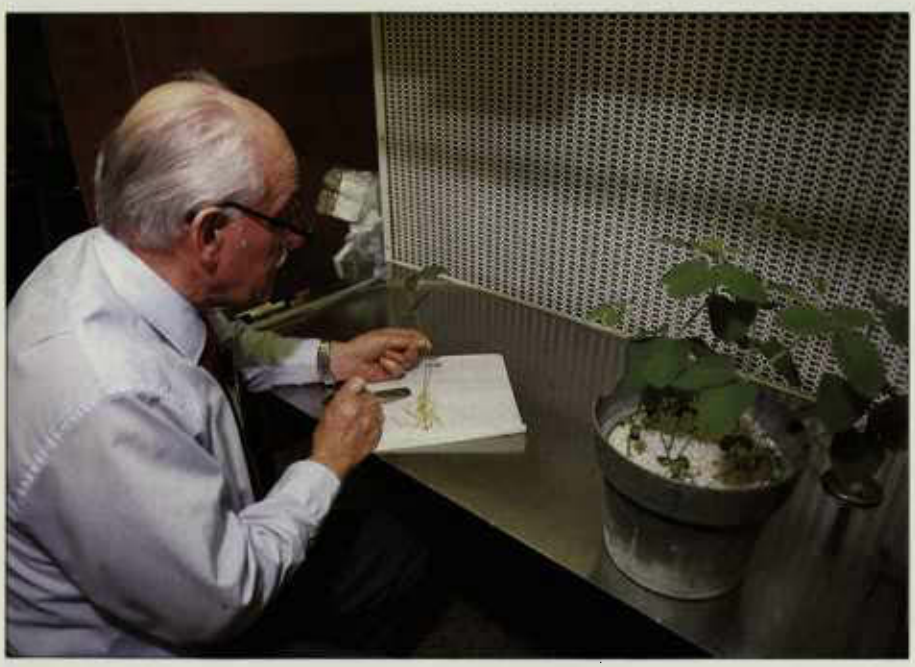
"Genius ... is an infinite capacity for taking pains."

Thayne Dutson, director of the Oregon Agricultural Experiment Station, agrees.

"Harold's work is long-term research that will pay off for the State of Oregon," said Dutson. "The understanding he's given us of the basic biology of nitrogen fixation will help others understand where the control points are in the process. With that kind of knowledge, the new biology may one day allow us to alter the system."

Evans' work also is the kind of basic research needed to prepare for crisis situations in food production, Dutson said.

"The Russian wheat aphid problem in our wheat fields is a current example in Oregon," he said. "You have to understand the basic biology of the plants and the insect to deal with the problem in a rapid fashion. Harold has spent many years collecting basic knowledge we need about nitrogen fixation. In the process he's brought a lot of positive recognition to Oregon from many parts of the world."



Evans examines nodules on the roots of a soybean plant in his laboratory.

A successful career is not established in isolation. Throughout the 40 years of his scientific career, Evans has worked closely with dozens of other scientists.

"Genius, it has been said, is an infinite capacity for taking pains. On that score, Harold Evans qualifies," said Emanuel Epstein, retired professor of botany and plant nutrition at the University of California at Davis.

"Everybody who has had scientific contact with him knows that nothing will do for him but the closest approach to perfection that is humanly possible. Experiments are repeated; they are modified and repeated again, and yet again. The keen attention that is paid to minute items is a revelation to anyone coming to that laboratory.

"Harold Evans would rank among the top half dozen plant scientists I would name if asked to draw up such a list. What comes out of that laboratory is important and stands the test of time," added Epstein.

"A very large percentage of the leading nitrogen fixation research conducted in this country is carried out by people who have benefitted from being in Dr. Evans' lab early in their career," said David A. Dalton, an assistant biology professor at Reed College in Portland, who studied at OSU under Evans.

"Dr. Evans has a truly passionate devotion to quality and is constantly striving to instill this concept in others. He does so by constructive suggestion and guidance that is never overbearing," Dalton added.

"The nearly three years I spent in Professor Evans laboratory were the most productive and exciting years of my career," said David Emerich, associate professor in biochemistry at the University of Missouri-Columbia, and past post-doctoral student of Evans'.

"His laboratory was an exciting place to be as ideas and concepts were constantly being discussed and debated. The driving force behind all this activity was Professor Evans himself," Emerich added.

Looking back on his 40 years, Harold Evans sums it all up simply.

"You have to be excited about your work and you have to push it," he mused. "There aren't any shortcuts."

Carol Savonen is a science writer and editor in the OSU Agricultural Communications Office.

THE NEW LEADER SEEMS FAMILIAR

Ron Mobley is an OSU pioneer.

He's the first person to simultaneously head both an Agricultural Experiment Station branch and an Extension Service county office.

Mobley is the new head of OSU's Southern Oregon Agricultural Experiment Station near Medford. He replaced John Yungen, who retired recently. Mobley will continue to serve, as he has since 1982, as agent and staff chair of the OSU Extension Service office in Jackson County.

According to Thayne Dutson, Agricultural Experiment Station director, Mobley's appointment reflects the partnership between agricultural research scientists and Extension agents and a movement to bring research and Extension into an even closer day-to-day working relationship.

The result should be better service to orchardists and ranchers in Southern Oregon, who look to research for answers to their problems and look to Extension agents as extenders of new knowledge from the station to the user, Dutson said.

His feelings were echoed by Ernie Smith, Extension Service director. Smith noted that joint appointments between Extension and the Agricultural Experiment Station are common among specialists based on the OSU campus.

Extension agents often assist with research programs, and may conduct small research efforts on their own, but Mobley is one of the first agents to hold a joint appointment, Smith explained.

The move to integrate Extension and research programs at the Southern Oregon station started about six years ago, Mobley said, when the office of the Extension agent working with commercial horticulture was moved to the Experiment Station from the main Extension office in Medford.

Mobley expects further integration of the Experiment Station and the Extension Service, both divisions of the OSU College of Agricultural Sciences. For instance, a new person, called a crop production scientist, will soon be hired on a joint appointment.

DAVE KING

Ron Mobley

There also may be greater involvement of OSU agriculture students in Jackson County, said Mobley. He sees opportunities for graduate students to work in research at the Experiment Station, and expanded opportunities for undergraduate or graduate internships in the Extension Office.

Mobley, who assumed direction of the Southern Oregon station officially on November 1, will change some of his Extension responsibilities. He will no longer have responsibility for Extension livestock programs. Details about how these responsibilities will be met are still being discussed.

Pioneering, and taking chances, are a part of Mobley's nature. He grew up on a ranch between Kent and Shaniko in Eastern Oregon. He ran his own cattle and wheat operation for a short time before joining the Extension Service in 1968 as an Extension agent in Gilliam and Wheeler counties.

Along the way, he developed a continuing interest in river running. For a while, he ran guided trips down the John Day River. He has also rafted the Deschutes and Upper Rogue Rivers and the Middle Fork of the Salmon River, among others.

"When we first started the guided trips down the John Day some people in Wheeler County thought it was pretty strange. Hardly anyone did river running in 1968. They thought we were just asking for trouble," he said. But getting out on the river appealed to him because "you have to adjust to the personality of the river and to nature." Today, it's a common activity.

Oregon is known for its pioneering work in land use planning and development, although land use isn't always a popular subject. Mobley was involved in that at an early stage, too. In the early 1970s, he wrote some of the early land use plans for Wheeler and Malheur counties. While serving as an Extension agent in Malheur County, he offered two pre-employment training programs for men, the only such programs ever offered for men by the Extension Service.

Mobley is excited about the opportunities his new role offers. He already sees the Southern Oregon area's Extension and research staffs becoming better acquainted. He said he's anxious to improve channels of communication in research and extension work along the lines of the "pure model" of the Land Grant system, with the Extension Service identifying and communicating research needs to the Experiment Station and then taking the findings back to the user.

A combined branch experiment station and county Extension Service office has it's dangerous side, though.

"There could be too many practical problems to solve or too many pointy-headed research projects," said Mobley. "But the growers in this area wanted this, and I see it as a positive challenge with more opportunities than roadblocks."

He said the producers in agriculture today already have a lot of things they used to get from the county agent.

"I believe the trend will be toward county agents doing more specialist-type work, specialists doing applied research, and researchers having more time to do basic research. I think we're just on the edge of something here."

—Len Calvert

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Oregon's Agricultural Progress

A PROBLEM IN PARADISE

(SEE PAGE 12)