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TRANSCRIPT

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FIRST HALF HOUR

HOST: Laura Knoy

REPORTERS: Cindy Shiner, Cynthia Graber, Johanna Eurich

GUESTS: Bob Moran, Mandiam Srinivasan

COMMENTATOR: Julia King, Sy Montgomery

(Theme music intro)

KNOY: From National Public Radio, this is Living on Earth.

(Music up and under)

KNOY: I'm Laura Knoy. It's being called Europe's worst environmental disaster since Chernobyl. A cyanide spill leaves two of the region's major rivers unfit to fish or drink. It's the latest in a series of mining accidents that some industry observers say could be avoided.

MORAN: There's a worldwide trend toward self-policing in industry, and it is a real problem because there are a lot of conflicts of interest.

KNOY: Also, digital television promises to revolutionize the entertainment industry. But what happens to the millions of analog TV sets that will soon be obsolete?

VOORHEES: If digital does come on like they say it will in a couple of years, obviously everyone's going to have to change their television, so that would put a huge slug of glass, probably, into the industry.

KNOY: Those stories on Living on Earth. First, news.

(NPR News follows)

(Music up and under)

## EUROPEAN CYANIDE DISASTER

KNOY: This is Living on Earth. I'm Laura Kroy, sitting in for Steve Curwood. People in Eastern Europe are struggling this week with what one government official calls the worst ecological disaster to hit the region since the Chernobyl nuclear power plant accident 14 years ago. Strained by rain and snow, the floodgates of the Baia Mare gold mine in Romania burst open on January 30th. Millions of gallons of wastewater escaped from a dam near the mine. The water is tainted with cyanide, a deadly chemical used in the mining process. Right now a cyanide plume is flowing down the Tisza and Danube rivers, through Hungary and Yugoslavia, killing thousands of fish and threatening the food supply and drinking water for millions of people. Cindy Shiner reports from the town of Szolnok in Hungary.

(Beeps; background conversation)

SHINER: Fish merchant Imray Borbiro is ringing up one of her few sales of the day. She says business has dropped by 95 percent in the past week. Customers tentatively walk by her shop in a market in the eastern industrial town of Szolnok, suspiciously eyeing the glistening fish in the window.

(Background conversations)

SHINER: One customer only half-jokingly asks if the fish has cyanide in it. Another customer has more confidence that the fish swimming in Borbiro's tank are safe.

(A sales receipt prints out)

SHINER: After all, these fish are still alive.

(Wrapping)

SHINER: Living fish are a rare sight these days as hundreds of tons of dead fish have already been hauled from the rivers of eastern and southern Hungary. The cyanide that killed them is a common ingredient in mining, used to leach small amounts of gold from rock. The Australian company involved in the accident, Esmeralda Exploration, stored its used cyanide in large pools of water, but recent heavy rain and snow caused the pools to overflow, releasing more

than 26 million gallons of cyanide-tainted water. So far the contamination has made its way more than 250 miles downstream, into the Tisza and Danube rivers in Hungary and Yugoslavia. For its part, Esmeralda Exploration says the damage isn't as great as reported and refuses to accept any responsibility. Spokesman Chris Codrington.

CODRINGTON: What we're saying is yes, there has been contamination. But the extent of that contamination as reported out of the region, we believe there's absolutely no evidence to link that to the tailings dam overflow.

SHINER: Gabor Koller with Hungary's Environment Ministry says that's simply not true.

KOLLER: [Speaks in Hungarian]

TRANSLATOR: What it is all about is that the Australian parent company says that we Hungarians just over-exaggerate the situation and the damage that happened to Hungary. But I think that the company should take much better care of how they function so as not to cause any danger to anyone.

SHINER: Environmental experts from the European Union and the United Nations are assessing the damage, which could give weight to Hungary's complaints. So far, no human illnesses or deaths linked to the spill have been reported. But officials are urging more than two million people to avoid drinking water or eating contaminated fish from the region. In the meantime, Hungarian officials are sealing the fish in protective covers and burying them. In response to perceived negligence, Hungary has threatened three lawsuits: one against Esmeralda, another against its Romanian partner, and another targeting the Romanian government.

(Traffic)

SHINER: Here on the Tisza River in Szolnok, small boats rest upside-down on the shores and hardly a ripple disturbs the water. The roughly 200 families in the city who made their living from fishing in the river are just as still, their livelihoods washed away. Throughout the region as many as 15,000 fishermen may be out of work for years.

RATZ: [Speaks in Hungarian]

SHINER: Sixty-year-old Mehi Adolf Ratz has been fishing on the Tisza for three decades. As he gazes upstream from a cement overlook, Ratz becomes emotional. He's lost his greatest pleasure: fishing in the river of his home town in his retirement years.

RATZ: [Speaks in Hungarian]

SHINER: Unfortunately, that's the way it is, he says. Then he turns his head, as tears fall from his eyes onto his plaid flannel shirt.

RATZ: [Speaks in Hungarian]

SHINER: I can see that I'm not going to fish in my lifetime any more. It's unclear when people like Ratz will be able to fish safely in the Tisza

again. Environmental officials say they don't expect full assessments to be completed until the end of March, because one of the contaminated rivers is still partially frozen. Hungary's Environment Ministry has set up a rehabilitation group for the Szamos and Tisza Rivers region to help bring the environment back to life. But that's little consolation to the already-impooverished communities that derive their livelihoods from these waters. For Living on Earth, I'm Cindy Shiner in Szolnok, Hungary.

## **ACCIDENTS AND REGULATIONS IN THE MINING INDUSTRY**

KNOY: Baia Mare is the latest in a series of cyanide spills from gold mines around the world. In the last five years there have been at least five major incidents. Bob Moran is head of Moran and Associates, a Colorado-based firm that consults with governments and companies on how to clean up after mine disasters. He says it will be a long time before the river cleans itself out, but no one knows just how long.

MORAN: There's an incredible number of unanswered questions relating to the environmental chemistry of cyanide. The mining people understand the chemistry very well within the processes of mining, smelting, milling. But the environmental side has not been studied adequately.

KNOY: And why not?

MORAN: My sense is that there is first a general discreditation of government roles in a lot of environmental affairs. They have in essence been told to stay out of the way of business development. So in essence, a lot of this has become a self-policing industry.

KNOY: What was the Romanian government's involvement in the mine?

MORAN: As far as I can tell, the Romanian government had something between 40 and 50 percent ownership of the mining property, and that's common. I've seen similar situations in Chile and in Kyrgistan and Indonesia, et cetera. There's no incentive to police aggressively if it would hurt your income, especially for a relatively poor developing country.

KNOY: So the foreign owners come in. They give the Third World country partial ownership. And then the two of them have a vested interest in keeping things quiet.

MORAN: Yeah, they have a vested interest in keeping quiet. It maybe sounds a little less nefarious to say they're also interested in making money. And there's no one else that's an independent party looking over their shoulder.

KNOY: We've been talking about spills in poorer countries, but there have been mining accidents and environmental problems with mines in this country, in your own state of Colorado.

MORAN: Yes, that's true. We had a significant spill in 1991 from a site

called the Summitville site. The volumes of water were much less than in the current spill event in Europe. But nevertheless, the costs for clean-up, depending on whose numbers you believe, have varied between about \$150 and \$200 million so far, and it's clearly not cleaned up.

KNOY: Dr. Moran, are there international or local regulations that would help prevent more accidents like this in the future?

MORAN: There are lots of regulations in various countries. The problem is more seeing that they actively enforce their regulations. Clearly there have to be some movements toward truly independent oversight. The consultants or whoever would be overseeing a spill like this would have to be making their living from a source that's separate from the mining industry. Secondly, I think there has to be some new form of financial assurance required. In other words, if a spill like this occurs, the company, even a foreign-based company, needs to be held liable to pay for the costs. These costs should not be subsidized by the taxpayers of the various countries involved.

KNOY: Bob Moran is a water quality and geochemistry consultant. He joined us from the studios of KUVU in Denver. Dr. Moran, thanks for speaking with us.

MORAN: My pleasure.

(Music up and under)

KNOY: What goes around can come around, even in the digital age. A new life for the 250 million television sets that are about to become obsolete is just ahead. Keep listening to Living on Earth.

(Music up and under)

## **TOXIC TELEVISION DISPOSAL**

KNOY: It's Living on Earth. I'm Laura Knoy. It appears we're on the verge of another television revolution. In just a few years many of us may have to throw away our current analog sets in favor of newer digital technology, which the electronics industry promises will make our favorite shows leap off the screen with lifelike clarity. The difference could be as dramatic as the advent of color TV about 40 years ago. This shift may create dramatic consequences for the environment as well. Millions of televisions could become obsolete and get thrown away. And, as Living on Earth's Cynthia Graber reports, TV sets are almost as toxic as some TV programs.

(Rock music revs up)

GRABER: The Best Buy superstore in Rockville, Maryland, has dozens of televisions on display, including several of the new high-definition digital sets. HDTVs deliver a dramatic viewing improvement, but one salesman here says so far they've been too costly to catch on.

(To salesman) How are the HDTVs selling?

SALESMAN: A couple a month. Not too many, you know, but it's going to pick up over the years.

GRABER: In just a few years buyers may have no choice. The FCC has picked 2006 as the target for turning America completely digital. Stations will stop transmitting their current analog signals. It's a controversial move, and it's beginning to alarm the agencies that regulate America's landfills and municipal waste incinerators. When the switch occurs, more than 250 million televisions could become obsolete.

(To salesman) What do you think will happen to all the old televisions?

SALESMAN: I think, you know, they're going to pile them up in some junk yard somewhere. I mean, if anybody wants to give away their TV, you know, come look me up. I'm willing to have a few TVs in my living room. (Laughs)

GRABER: The problem is that once the digital revolution begins, nobody will really want your old analog sets. Converter boxes might be able to squeeze some extra life from your current television, but throughout the country officials are worried about a wave of electronic garbage.

(Drills)

PELLOQUIN: So we're just going to go through the steps now to completely de-manufacture this, and this one will be 100 percent recycled. So, first step, he's going to remove the rear cover.

(Drills)

GRABER: Dick Pelloquin has been repairing television sets in a wooden warehouse near Spencer, Massachusetts, for 27 years. Now, he's become one of the first repairmen to enter the world of TV recycling.

PELLOQUIN: I just happen to be an individual who's been recycling for years. It made me upset to throw away anything that looked like it might be usable later on for something else, much to my mom's dismay.

(Drills)

PELLOQUIN: This one is built like a battleship.

GRABER: Screws are scattered around the workshop floor here. Large wooden bins hold various components, the printed circuit boards, wire with thick plastic coating, rubber, batteries from remote controls. Mr. Pelloquin and his assistants reuse as many parts as possible or sell them to other repair shops. Anything they can't use is shipped off to be melted down for raw materials.

(Parts being moved)

PELLOQUIN: The assembly that he's just removed contains copper wire -- the printed circuit boards. I see some aluminum panels, some

mild iron or steel panels.

GRABER: Mr. Pelloquin's not just trying to conserve natural resources. He's also trying to keep toxic parts out of the wastestream. Soldering contains lead and circuit boards have heavy metals such as cadmium and mercury. In the landfill, these metals could contaminate nearby groundwater. And in incinerators, they end up in smokestack emissions and in the ash.

(Parts being moved; drilling)

PELLOQUIN: And here's what you've been waiting for. We're down to the CRT itself.

GRABER: Perhaps the most dangerous part is the picture tube, known as the CRT, the cathode-ray tube. The glass is loaded with lead to protect viewers from radiation. A typical set contains more than four pounds of lead. Dick Pelloquin and his staff of ten can disassemble 20 televisions a day. This labor-intensive process underscores just how difficult it may be to recycle the 250 million sets in the United States. Some environmentalists believe it won't be long before cities are overwhelmed, and they don't feel the electronics industry is doing its part.

SMITH: If we don't do something quickly, we're going to be faced with an amazing and enormous problem. Right now we have a situation where a producer makes a product, sells it, makes a profit, and then forgets about it.

GRABER: Ted Smith is the executive director of the Silicon Valley Toxics Coalition in San Jose, California. He believes the American electronics industry should have to do what the auto industry is being forced to do in Europe: take back their products at the end of their life for recycling.

SMITH: And if they do that, it's going to cause them to think a lot more seriously about some of these disposal problems and the cost of disposal and the toxic issues involved. Right now they don't have to worry about that since they're not responsible for it.

GRABER: The electronics industry opposes the notion of take-back regulations. Jeff Joseph is the spokesman for the Consumer Electronics Association, a trade group.

JOSEPH: I think there is some danger there, when we talk about government regulations, and industry assuming the cost of that. I think what we'd rather see is voluntary programs in which manufacturers work with local communities to provide solutions. Some of our manufacturers work with local communities to recycle the product, to redistribute used product to low-income and disadvantaged neighborhoods. So I think we'd rather see that sort of solution than some broad government mandate.

(Sawing)

GRABER: One venture that the electronics industry has encouraged is the start-up of a picture tube recycling facility. This is Envirocycle in

Halstead, Pennsylvania. Here, the leaded glass from picture tubes is sorted, broken down, and prepared for melting. Greg Voorhees, vice president of Envirocycle, stands amid hundreds of dusty gray tubes, which will be sliced into pieces by a six-foot saw.

VOORHEES: So all we need to do now is separate the panel glass from the funnel glass and the neck glass, so you have a frit glass that connects the panel and funnel. And that's all separated up here using some saws that we've developed.

(Sawing)

GRABER: Envirocycle is one of two recyclers in the U.S. that handle the glass from cathode-ray tubes. They started in 1991, when the CRT industry asked them to recycle scrap glass from factory rejects. The glass is valuable because it melts at lower temperatures and reduces energy needs. Now that the process is proven to work, Envirocycle is accepting glass from home TVs and computer monitors. Most consumer televisions make up a small fraction of Envirocycle's overall business, but Mr. Voorhees expects it to grow.

VOORHEES: The digital will definitely change that. I mean, if digital does come on like they say it will in a couple of years, obviously everyone's going to have to change their television, so that would put a huge slug of glass, probably, into the industry.

GRABER: Mr. Voorhees won't disclose exactly how many television tubes he could recycle, but says his factory is operating well below capacity right now.

(Broken glass spills)

GRABER: Even though there is a strong market for used CRT glass, the problem remains how to get the picture tubes to the factory for recycling. Collecting bulky televisions and computers is expensive, and only a few states are doing it. Some communities gather electronic devices on hazardous waste collection days. One state, Massachusetts, will soon impose a landfill ban in coordination with a reuse and recycling program. But these efforts are costly, and most states are avoiding the issue.

(Drills)

GRABER: The fact is, it's unlikely we'll end up with 250 million obsolete televisions overnight. The deadline might be pushed back if enough people don't own digital TVs by 2006. Even if the FCC does hold to its deadline, some people will buy converter boxes instead of new digital sets. But in any case, whether the shift happens rapidly or over a number of years, someone, whether industry, state, or local government, is going to be left with the cost of dealing with millions of useless TVs.

(Parts fall)

GRABER: For Living on Earth, I'm Cynthia Graber.

(Parts fall; wood snaps)

## TROUBLESOME AUTOMATIC TOILETS

KNOY: Many technological advances have entered our lives with the promise of being more environmentally friendly than what came before. Solar power, for example, and catalytic converters, or energy-saving motion sensors that turn lights off when no one's around. But as commentator Julia King found out, even in service of our most natural activities technology can sometimes get in the way of the best of intentions.

KING: Pardon this intimate disclosure, but in my home we share flushes. Not all flushes, mind you, just the civilized ones. In the name of water conservation, my husband and I have become the butt, so to speak, of family jokes. "Oh, Jim," my mother-in-law yells to her husband from the bathroom, offering to share the flush, "do you need to go?" They erupt in laughter as though nothing in all the world could be more foolish.

Let them laugh. We are proud, lowbrow conservationists. Yet, even when one's resolve is strong, there are times when opportunities to conserve are scant. Advanced technology in some public restrooms is thwarting my favorite conservation effort. For anyone who doesn't get out much, let me explain. Many toilets now flush themselves.

It used to be that my little girl and I followed a one-stall, one-flush policy. Sharing a flush meant sending only half of our allotted seven gallons to the nearest wastewater treatment facility. But now some commodes have sensors that alert the toilet when you're done. Presto, it flushes. Or at least that's what's supposed to happen. Unfortunately, the sensors can't tell the difference between being done and simply moving out of the sensor's range. Unless you're as motionless as a forest creature who's just been spotted by a hunter, your toilet is going to flush. Forget sharing. If I can get out of a stall with fewer than three flushes, I reward myself with a hand-washing.

These toilets also can't tell if you've just stepped in to fix your pantyhose -- flush -- or to blow your nose -- flush -- and never mind that my daughter would rather wrestle tarantulas than sit on a toilet that turns into a bidet and then threatens to suck her down into the sewer.

Apparently, automated toilets appeared in response to those people who take water conservation one step too far and refuse to flush at all. So in typical entrepreneurial spirit, somebody fixed the problem. And as these things often go, they created a new problem. And while regulators and industry specialists fight over how much -- or how little -- water can go into one flush, they're overlooking an equally important issue: How many times should a toilet flush? And should the toilet itself get to make such a crucial decision? If automation or smart technology is the wave of the future, so be it. But if this toilet's so clever, let's teach the thing how to count. To one.

KNOY: Commentator Julia King lives, writes, and flushes every now and again in Goshen, Indiana. She comes to us by way of the Great Lakes Radio Consortium.

It's NPR's Living on Earth. I'm Laura Knoy.

(Music up and under)

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(Music up and under)

NPR ANNOUNCER: This is NPR, National Public Radio.

KNOY: Just ahead: In the land of the Iditerad, snowmobiles are replacing dog teams on the trails. How two towns in the Alaskan backcountry are responding to the change. Stay tuned to Living on Earth.

(Music up and under)

SECOND HALF HOUR

## **LIVING ON EARTH ALMANAC**

KNOY: It's Living on Earth. I'm Laura Knoy

(Music up and under: "Here Comes the Sun")

KNOY: Each dawn on February 22nd, hundreds of people gather at Abu Simbel, Egypt, to witness a rare solar event: the lighting of the statues at the Temple of Ramses the Second. This phenomenon, which corresponds to the Pharaoh's birthday and accession to the throne, lasts about 20 minutes and takes place twice a year. Here's how it happens: More than 3,000 years ago Ramses carved a temple out of rock to honor his power and divinity. He claimed to be the reincarnation of a child born to the sun god. The temple is precisely oriented toward the east, so that twice a year, on the spring and autumn equinoxes, rays of the rising sun shine directly through a narrow entrance to illuminate statues of Egyptian sun gods, including Ramses, in the chamber's inner sanctuary 200 feet within the rock. After the construction of the Aswan Dam in the 1960s, rising waters of the Nile threatened to submerge the temple. It took an international effort and \$40 million to reconstruct the monument on higher ground. The archaeological rescue operation was able to maintain the temple's alignment with the sun, but, because of the new position, the sun rays now enter the sanctuary one day later than Ramses had intended. And for this week, that's the Living on Earth Almanac.

(Music up and under)

## **FIGHTING SNOWMOBILE NOISE**

KNOY: You'd think Alaska would have plenty of room for skiers and dog mushers and snowmobilers, but only so many people can use the limited number of trails that run through the state. And the growing number of snowmobilers is threatening to transform Alaska's backcountry. Johanna Eurich went to the Upper Susitna Valley just south of Mt. McKinley, the continent's highest peak, which is now one of the state's most popular snowmobiling areas. She found two

communities taking very different approaches to the machines.

(A snowmobile revs up)

EURICH: If you've got a snowmobile, the place to go in the Upper Susitna Valley is the Petersville Road in Trapper Creek. There are wide open muskegs and gentle hills running right up into the glaciers flowing out of the Alaska Range. It's spectacular country, and it was quiet and relatively inaccessible until bigger, better snow machines brought it within reach of a weekend jaunt.

(Snowmobile motor)

EURICH: On weekends the parking lots fill up with pickup trucks from the city hauling two or more snow machines each.

BECKMAN: Her name is Zeena, and she's a 1994 Summit 583. And she rides great. Cheapest recreation I could do. (Calls to others) Okay, you guys ready to ride?

(Engines start up)

BECKMAN: Music! Music to my ears! (Laughs)

EURICH: Marianne Beckman drives off in search of fresh powder. The rush of snowmobilers has brought an economic boom to Trapper Creek, where B&Bs and lodges often make more in the winter, catering to snow-loving Alaskans, than they do in the traditional summer tourist season. Snowmobiling has transformed the way of life here. Gone is the community of dog mushers who once made the area a sled dog center. Iditarod veteran Bill Hall is one of the few who remain. He and a couple of others maintain 200 miles of trails in the hills to train their teams.

(Dogs bark)

HALL: Snow machines and dogs can't really coexist on the same trail system. One snow machiner screws it up for everyone. As the snow machiners come, we go further out -- so we have a piece of land further out, and that's just the way it is.

(Dogs bark)

EURICH: Every winter for the last few years, some musher has lost a dog in a snowmobile accident. For protection, Mellen Shea now pays a neighbor to ride a machine in front of her dog team when she mushes to her cabin.

SHEA: It's so sad to go up there now on a holiday, and open the door, and hear, like, a swarming, buzzing nest of bees. It's nonstop. We are four miles off the Petersville Road area, but you can hear that all the way, a constant one after another -- zoom, zoom, zoom.

(Snowmobile engines)

EURICH: It's noisy because riders are using residential trails to get out

to open country. To lessen the disturbance, Trapper Creek plans to build a recreational trail designed to avoid backcountry cabins and subdivisions.

CROSBY: Now it's just a matter of continuing it on the ground, and that takes time and money. And not everybody has much of either right now.

EURICH: Linea Crosby is president of a snowmobiling club. She says Alaska is 20 years behind other snow communities in the United States and Canada in building winter trails. While they want a better trail system, Alaska's snowmobilers want to avoid some of the more restrictive measures that have limited riders in other states from exploring open country. Unlike some parts of the Lower 48, it's unlikely Alaskans will support banning snow machines. They're just too useful.

(Engines)

EURICH: Across the river from the Petersville Road is the tiny, quaint village of Talkeetna, population 600. On Main Street, snow machines gas up alongside cars at the town's only gas station. The urban gloss has been scraped off these snow-gos. They are smaller, older. Some hold sleds with gear and groceries. Many riders are backcountry residents in town doing errands before heading out to their homes in the woods. No one calls these machines snowmobiles. They're snow machines, reflecting their utilitarian purpose. But residents look across the river at hordes of recreational snowmobiles, and worry Talkeetna may be the next destination.

ROBINSON: We're very fearful we're going to end up looking like a mini-Petersville.

EURICH: Pam Robinson chairs the Talkeetna Community Council Trails Committee.

ROBINSON: I don't think too many people in the community are excited about that idea, even those that snow machine on a regular basis. I don't think they're real fond of becoming a big playground for a lot of other users, either.

EURICH: The community council has no real power to keep snowmobilers away. Talkeetna is so tiny it doesn't even have a town cop. It does have a reputation for aggressively defending its privacy. It has used its limited clout to keep the crowds away, even when it meant turning down a proposal to host the state's board sled dog race. Residents feared recreational snowmobilers building trails for sled dogs would later use those same trails to access the backcountry. This winter, rumors for an ad campaign promoting Talkeetna as a destination for snowmobilers resulted in an anonymous flier advising riders to go elsewhere. But these efforts may not be working. A new lodge has been promoting winter weekend getaways to Anchorage residents, and now Steve Mahay, a local businessman, has opened the door to recreational riding by starting a small-scale backcountry tour operation.

MAHAY: I haven't had too much opposition against it. Of course, I've been avoiding all the public meetings on it, so that always helps.

EURICH: Steve Mahay thinks if Talkeetna did more to welcome recreational snowmobilers and provided trail maps, there would be fewer riders getting lost and ending up on private property. But some residents fear maps would attract more riders and more problems. Others worry about any increase in winter tourism. Talkeetna already has a robust summer season with village streets crowded with climbers, sightseers, fishermen, and rafters. Big game guide Rob Holt puts up with the frenetic summers to enjoy the winter's quiet.

HOLT: I don't want to see it anywhere approaching what's happening in summer. And I don't care who they are. (Laughs) I don't care if they're skiing or snow machining or what. I don't think it's necessary to have year-round tourism and year-round crowds.

WOMAN: See you.

(A man laughs)

EURICH: At Nagley's, Talkeetna's historic log cabin general store, Laura Nelson works the counter and complains about out-of-town snowmobilers.

NELSON: Oh, we hate them. (Laughs) We do. They're intrusive. They are obnoxious. They are disrespectful. . .

EURICH: Her list reads like a rap sheet for recreational snowmobiling. Yet she, like others all over snow country, is not immune to the seductions of the sport. Snowmobiles have made getting out in Alaska's winters far less daunting than it was in the days of prospectors and homesteaders, or even a few short years ago.

NELSON: I am a little bit of a hypocrite. I mean, I had an opportunity to take a snow machine across the river last year, and I danced around behind the counter like some child who had just seen the Beatles or something, some teenage girl.

(A snowmobile engine revs up)

EURICH: While Talkeetna tries to find the political tools to protect the peace and quiet in its backcountry, the nature of the community itself is changing. More people are moving in, many of them from the city, bringing with them their snowmobiles. I'm Johanna Eurich.

(Engines and barking dogs, fading to music up and under: "Flight of the Bumblebee")

## **SOLDIERS STUDY BEES**

KNOY: The U.S. military is going to the bees to learn how the better to see you. The Pentagon is helping fund research that may someday lead to tiny flying spy machines based on insect navigation. It's long been known that honeybees use body language to direct nest mates to sources of pollen and nectar as far as six miles away. It's called a waggle dance, and the longer the dance, the further away the food. Now scientists think they've discovered just how honeybees measure these distances. The research effort is led by Mandyam Srinivasan, a

biologist at Australia National University. Professor Srinivasan joins us now from the studios of the Australian Broadcasting Corporation in Canberra. Thanks for taking the time today, professor.

SRINIVASAN: Thank you very much.

KNOY: So, tell me, just what does the waggle dance look like?

SRINIVASAN: A worker bee that's found a good source of nectar comes back to the hive, and then she basically shakes her hips from side to side. And it turns out that the duration of this waggle, measured in seconds, for example, is a measure of how far away the food source is. And the direction in which this waggle part of the dance occurs tells the other bees about the direction in which they should fly to get to the food source.

KNOY: You've written that the honeybees use something called an optical odometer. Now what's that?

SRINIVASAN: When this bee comes back, this bee has to transmit the information about the distance to the food source to the other bees. And the question that's been puzzling us and several other people in the past is, how does she figure out how far she's flown? The cue that they seem to be using is really, they're looking at the world as they fly to the food source, and they're looking to see how much the world, how much the image of the environment has actually whizzed by on their eyes. And if there's been a lot of image motion on the eye, they infer that they've flown a long distance. And if the world hasn't moved very much at all, they infer that it's a very short distance. So, this odometer now turns out to be visual, optically-driven, and not driven by, you know, how many wing beats you've made or measuring even the time taken to get there.

KNOY: Now, how did you figure this out?

SRINIVASAN: We took a tunnel and placed it right at the entrance to the hive. The inside of the tunnel was lined with something like wallpaper, a randomly-textured black and white checkerboard. So we put a feeder at the end of this tunnel, so bees had to fly, get out of the hive, and fly into this tunnel a distance of six meters to find a reward of sugar water, and then fly back to the hive. And then we looked at the dances, and to our surprise, when the bees danced they were signaling not six meters, but a distance of 200 meters. And for some time we really couldn't understand why. And then we reasoned that maybe what was happening was that, because the walls of the tunnel are very close to the bee, I mean the tunnel is very narrow, the environment appears to move by on the eye very rapidly. For example, if you were to fly from Boston to New York and you look at the ground, the ground wouldn't move very much at all and you wouldn't think you've traveled very far. But if you drove from Boston to New York, you'd see a lot of image motion and you do get the impression you've traveled a lot. So maybe that's what's happening with the bees as well. Well, we tested this idea by taking away this textured wallpaper, just replacing the walls and the floor with just a plain blank white lining, and then looked to see what the bees did when they flew the same distance. And then, to our surprise, again, they showed zero. They showed no distance at all. It's as though their odometer simply wasn't ticking here, because the bees weren't seeing any image motion at all.

KNOY: Well, with all due respect, Professor, this is very interesting. But why do we need to know this?

SRINIVASAN: One of the things we are pursuing is looking to incorporate some of these principles into flying vehicles. You know, if you try to swat a fly, for example, or watch a fly do a graceful landing on the rim of your coffee cup, you notice that it has an exquisitely sensitive visual system and a very precise flight control system. And it does all this with a brain that weighs less than, you know, a tenth of a milligram. So the question is, how do they do this, and do they use any simple tricks that we could learn about and perhaps incorporate into small flying machines that fly about autonomously?

KNOY: It's something that the military has been interested in.

SRINIVASAN: Well, for all kinds of surveillance, for example, it's safer, I suppose, to have vehicles that would be unmanned, and that could be sent away, dispatched on missions to do reconnaissance, surveillance. Having some sort of autonomous vehicle like this that can be told to just simply get there, get somewhere, and have a holding pattern there where it could observe the coastline, or observe something that's going on of interest, would be very useful.

KNOY: Mandyam Srinivasan is a biologist at Australia National University in Canberra. Thanks for joining us.

SRINIVASAN: Thank you very much, Laura.

(Music up and under)

## **LISTENER LETTERS**

KNOY: Time now for your comments.

(Music up and under)

KNOY: Listening to our interview with Jamaica Kincaid about her exotic garden, Cindy Hildebrand of Ames, Iowa, thought one thing needed pointing out. "I hope and assume Jamaica Kincaid had a permit to bring bulbs to Vermont from Antigua. There are good environmental reasons for this requirement. But many people," Ms. Hildebrand writes, "seem to think that just sticking the bulbs or seeds or cuttings in their luggage and not mentioning them is fine."

Our interview with Science Times editor Janet Raloff about the dangers of backyard trash burning left a few listeners confused. Suzanne Hirrel hears us on KUAR in Little Rock, Arkansas, and writes, "Ms. Raloff stated that a family of four that recycles produces more dioxin than a non-recycling family. Is she saying that recycling produces dioxin?" We asked Janet Raloff to clarify, and she explained it this way: Keeping recyclable materials in a pile of trash actually does reduce the amount of dioxin produced when that pile is burned. For one thing, the mix of many different ingredients in that pile interferes with the ability of chlorine to produce dioxin, and recyclable items like paper and cardboard make the fire burn hotter. The hotter the fire, the less dioxin produced.

You can light our fire by calling our listener line any time. The number is 800-218-9988. That's 800-218-9988. Or send us an e-mail at [letters@loe.org](mailto:letters@loe.org). When we come back, Sy Montgomery's search for the Golden Moon Bear is over. We'll find out if she's found a new animal species. Stay tuned to Living on Earth.

(Music up and under)

## **GOLDEN MOON BEAR: AN UPDATE**

KNOY: It's Living on Earth. I'm Laura Knoy. Late last year we brought you the story of Living on Earth commentator Sy Montgomery's search for the Golden Moon Bear. Some biologists suspected this animal could be a new species of bear, but they needed evidence. So an expedition was formed to retrieve DNA samples, which would determine if the bear's genes were indeed unique. Well, Sy's search is over, and today we have an answer to the origins of the mysterious Golden Moon Bear.

(A vehicle drives and rattles)

MONTGOMERY: There are bears all around us. That is the sound of a bear chewing. That's a car.

GALBREATH: You've just got to be careful of these guys over here.

(An engine starts up)

MONTGOMERY: With biology professor Gary Galbreath of Northwestern University, I'm on a scientific quest through Southeast Asia to document a type of bear never before recorded: a bear with a golden coat. Our search for the Golden Moon Bear began in the unexplored jungles and small villages of Cambodia, where we photographed and collected hair samples from both black Moon Bears and the golden bears that have never before been described. Today we're in Thailand at a wildlife center south of Bangkok. We drive through a virtual sea of some 40 shaggy black Moon Bears, some of them 300 pounds, roaming free in a large outdoor enclosure. These bears were all rescued from the illegal trade in wild animals.

GALBREATH: I believe -- I haven't done an exact count -- but I think I've seen more Moon Bears in one day here than I've seen in my entire life, all the living Moon Bears I've seen elsewhere put together. So it's quite exciting for somebody who's interested in Moon Bears.

(A bear pants)

MONTGOMERY: But there are no blonde bears here. So we head to a site north of the city. We've heard of an adult Golden Moon Bear who lives here, the largest and blondest specimen of a creature who might represent the first new species of bear to be recorded in more than a century.

GALBRAITH: We're at Lop Buri Military Zoo in Lop Buri, Thailand, one of the oldest cities in this part of the world. And we're headed for the Moon Bear cage.

MONTGOMERY: This zoo is run by the Thai military. Officially it's called a special warfare center. But the soldiers here are keepers for an eclectic collection of animals, most of whom were rescued from the illegal trade in wild animals. Most were captured for pets or for ingredients in medicines and delicacies like bear paw soup.

(Bear sucking sounds)

GALBREATH: And here's a lovely -- a lovely creature: an almost completely blonde Moon Bear with a shaggy mane that has almost no black in it, and virtually none elsewhere. So this is the blondest Moon Bear to our knowledge anywhere, and there is another one that's about half black and half blond, snoozing or resting in the background here. She's a lovely bear. Basically this is a blonde bear, and this big, thick blonde mane, like a lion's but blonde, on the other side of the head. There's a Sun Bear here sucking its digits, as they are prone to do. And there are a bunch of other Moon Bears, mostly sitting or even sleeping in the background.

(Bear sucking sounds)

MONTGOMERY: This is the sound young bears make when they nurse. But these are adult bears, and yet they still make this sucking sound. We realize why. All seven bears were captured by poachers when young, their mothers probably killed. They still suck their paws for comfort, just like human babies suck their thumbs. One of the black Moon Bears here is called Stumpy. Poachers already cut off one of his feet for bear paw soup by the time he was rescued and brought to the zoo.

(Bear sucking sounds, barks)

MONTGOMERY: These bears spend much of their day in a spacious fenced area, with bathing pools and climbing platforms and plenty of shade. In the evening they return to their big indoor cage.

MAN: And you help me, when she walks inside, you just call this one.

GALBREATH: Oh.

(A gate shuts, is locked)

MONTGOMERY: Great.

MAN: All right, now, we can do what you want.

MONTGOMERY: Their indoor enclosure has a squeeze cage, movable, lockable bars that allow you to immobilize an animal to give it shots or a veterinary exam. With the bear in the squeeze cage, I'm going to try to pull out some hair with my tweezers. When we get back to the States, we can have the follicles chemically tested to see how the DNA compares with that of our Cambodian bears, and help us determine whether the golden bears we're finding in Southeast Asia are a new species.

(Kissing sounds. A man calls, "Ah, ah, ah, ah, ah, ah, ah...")

MONTGOMERY: All right?

GALBREATH: Yeah.

MONTGOMERY: There are three. I'll get you some more.  
One by one we take hair samples for each of the seven Moon Bears,  
blonde, light, and black.

(Scraping sounds)

MAN: Here you go!

MONTGOMERY: Okay, we've got another bear.  
To make sense of the findings, though, it's essential to find out where  
the lighter-colored bears came from. We asked the zoo's director,  
Lieutenant Colonel Wirat Pupianji.

PUPIANJI: [speaks in Thai]

MONTGOMERY: Colonel Wirat tells us both the Golden Moon Bear and  
the pale-faced Moon Bear come from the same area, a mountainous  
region in the north near the border of Thailand and Laos. Plotted on a  
map, all our Golden Moon Bear sightings seem to occur along a line  
stretching 1,300 kilometers, from the Elephant Mountains in Cambodia  
through Laos and Thailand, up through Yunnan, China, where Gary  
first saw a Golden Bear 11 years ago. But what is the Golden Moon  
Bear? Whether we're on the track of a new species, a new subspecies,  
or a new color variation, we won't know till we get the hairs back to  
the States for the DNA tests.

(Voice on speaker: "Good morning, ladies and gentlemen, and  
welcome to United Airlines flight number 763...")

MONTGOMERY: Months later, Gary calls. He asks me to meet him and  
our Cambodian colleague Sun Hean in Chicago. Over dinner, he tells  
us what was found in the hair samples.

(Silverware clinks)

GALBREATH: Okay. They were sent to a laboratory at the University of  
Idaho, and I just -- well, just a few days ago, got information back  
that all the Cambodian samples were identical. Now, we looked at a  
particular strip of mitochondrial DNA...

MONTGOMERY: The bottom line: We do not have a new species. At  
first the news is a bit disappointing to Sun Hean and me. But, as Gary  
explains, what we have discovered is of considerable biological  
interest. It's what scientists call a new color phase. It's as if we found  
out that zebras come in red as well as black and white, or discovered a  
bunch of polar bears who are naturally brown instead of white. What's  
remarkable is none of these color variations have ever been described  
in the scientific literature before now.

HEAN: That is the point that we made for this thing.

MONTGOMERY: There's a lot more out there.

HEAN: A lot of them that we did not discover yet.

MONTGOMERY: This would be comparable to something like the white tigers in India. And there's others.

HEAN: I think one is the black leopard.

MONTGOMERY: Right.

HEAN: And also, I heard some information from local people about white elephants.

MONTGOMERY: How could these Golden Moon Bears go unreported for so long? Cambodia's been a war zone for more than 20 years, and its borders heavily mined. Only recently have scientists begun to document its amazing wildlife. In the 1990s alone, researchers have reported no fewer than five new species of hoof mammals in and near Cambodia's borders. And this beautiful color variant to the Moon Bear managed to survive undocumented, until now.

HEAN: I think also that is the first scientific discovery that Cambodia's made after the 20 years of political and social situation.

MONTGOMERY: Our work begins a new partnership. There are more questions to be answered: Are the Golden Moon Bears found throughout Southeast Asia, or in just a couple of isolated populations? The DNA from the Cambodian bears was the same, but there were significant genetic differences among the Thai bears. Can we make evolutionary sense of that variation? And most importantly, can the bears and their habitat be protected? Gary Galbreath sees Cambodia as a land facing unique conservation challenges and unique opportunities.

GALBREATH: I think it is widely unrecognized the world over among conservationists just how much rainforest still exists in Cambodia, what amount of wildlife still exists there. I think the opportunities for preserving natural tropical ecosystems, rainforest ecosystems, over wide areas are maybe unparalleled in southern Asia. And the Golden Bear could color phase, even if it's not a species, a new color phase could very well become emblematic of conservation in Cambodia.

MONTGOMERY: It could be Cambodia's totem animal.

GALBREATH: Mm hm. Indeed. I would then like to propose a toast to the Golden Moon Bear expedition to Southeast Asia, and what was indeed the successful conclusion to it. We have answered the question we set out to ask, and we've come with new questions to ask, which is typical of good scientific research anywhere. So, to all of you.

MONTGOMERY: Here, here.

(Glasses clink)

GALBREATH: Yep. And to Sun Yin Hean.

HEAN: Okay.

MONTGOMERY: Yay!  
For Living on Earth, I'm Sy Montgomery.

(Music up and under)

KNOY: And for this week that's Living on Earth. Next week we take another look at solar energy in the developing world, this time from Morocco, where efforts to bridge the gap between the short-term expense and the long-term economy of solar electricity are underway.

MAN: The people would like to have access to the solar energy, but we would have to solve the financing problem. If you take a solar module today, it's between \$500 and \$1,000, but it's something that can last for 20 years. If you factor that, you can see that it's going to be cheaper than using candles, cheaper than using butane gas.

KNOY: A solar solution for Morocco, next week on Living on Earth. We're produced by the World Media Foundation in cooperation with Harvard University. Our production staff includes Jesse Wegman, Anna Solomon-Greenbaum, Cynthia Graber, and Stephanie Pindyck, along with Peter Shaw, Leah Brown, Susan Shepherd, Bree Horwitz, and Barbara Cone. We had help this week from Hannah Day Woodruff, Steven Belter, and Emily Sadigh. Michael Aharon composed the theme. Eileen Bolinsky is our technical director. Liz Lempert is our western editor. Diane Toomey is our science editor, and Peter Thomson is special projects editor. Terry FitzPatrick is the acting senior editor, and Chris Ballman is the senior producer of Living on Earth. Steve Curwood returns next week. I'm Laura Knoy. Thanks for listening.

(Music up an under)

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