SUNDAY, SEPTEMBER 27, 1998

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## 

He's this country's premier wildlife painter and easily the most successful commercial artist in our history. So why doesn't Robert Bateman get any respect?

IN TODAY'S WEEKLY



- How Alanis spent her summer
- What's wrong with the NFL?
- Why we hate Ally McBeal
- Hollywood's blockbuster film factory
- Plus Stephen King's Bag of Bones

# 'Don't bow to Asian dictators'

Ex-governor of Hong Kong chides Canada for putting trade before human rights

BY SHANNON KARI

TORONTO — The last British governor of Hong Kong says it is time for the west to stop the "red carpet" treatment for the leaders of Asian countries with a poor human-rights record.

Chris Patten's statements coincide

with increasing criticism of the RCMP for using pepper spray on demonstrators at last fall's APEC summit in Vancouver and of the role the Prime Minister's Office may have played in trying to prevent any embarrassment for then-Indonesia dictator Suharto.

In Toronto to promote his new book

on his term as governor of Hong Kong, East and West, Mr. Patten would not criticize the Canadian government directly, preferring to speak on what he called general examples. But, he said, "if the Indian president went to France or Germany, I very much doubt the French or German governments would take special measures to try to ensure the Indian president didn't see any demonstrators."

Mr. Patten suggested there is too

because of a belief in the vast economic potential in the region and a lack of understanding of its cultures and val-

In his book, Mr. Patten writes that Prime Minister Jean Chrétien decided to withdraw support in 1997 for a UN resolution condemning China's human-rights record because he feared Canadian businesses would lose hydro-electric contracts in the country.

much appeasement of Asian leaders A spokesperson in the Foreign Affairs department said recently there is no basis for the assertions.

Mr. Patten stands by what is in the book, but added, "I have deliberately tried not to be too critical of countries outside Europe. I have noted what they did, and saved most of my criticisms for the way the European Union behaved."

See PATTEN on page A2

#### AN OTTAWA CITIZEN SPECIAL REPORT

## Prison doctor sheds no tears

He has lost his licence. He is being sued. But Dr. George Scott defends his LSD experiments, write Mike Blanchfield and Jim Bronskill.

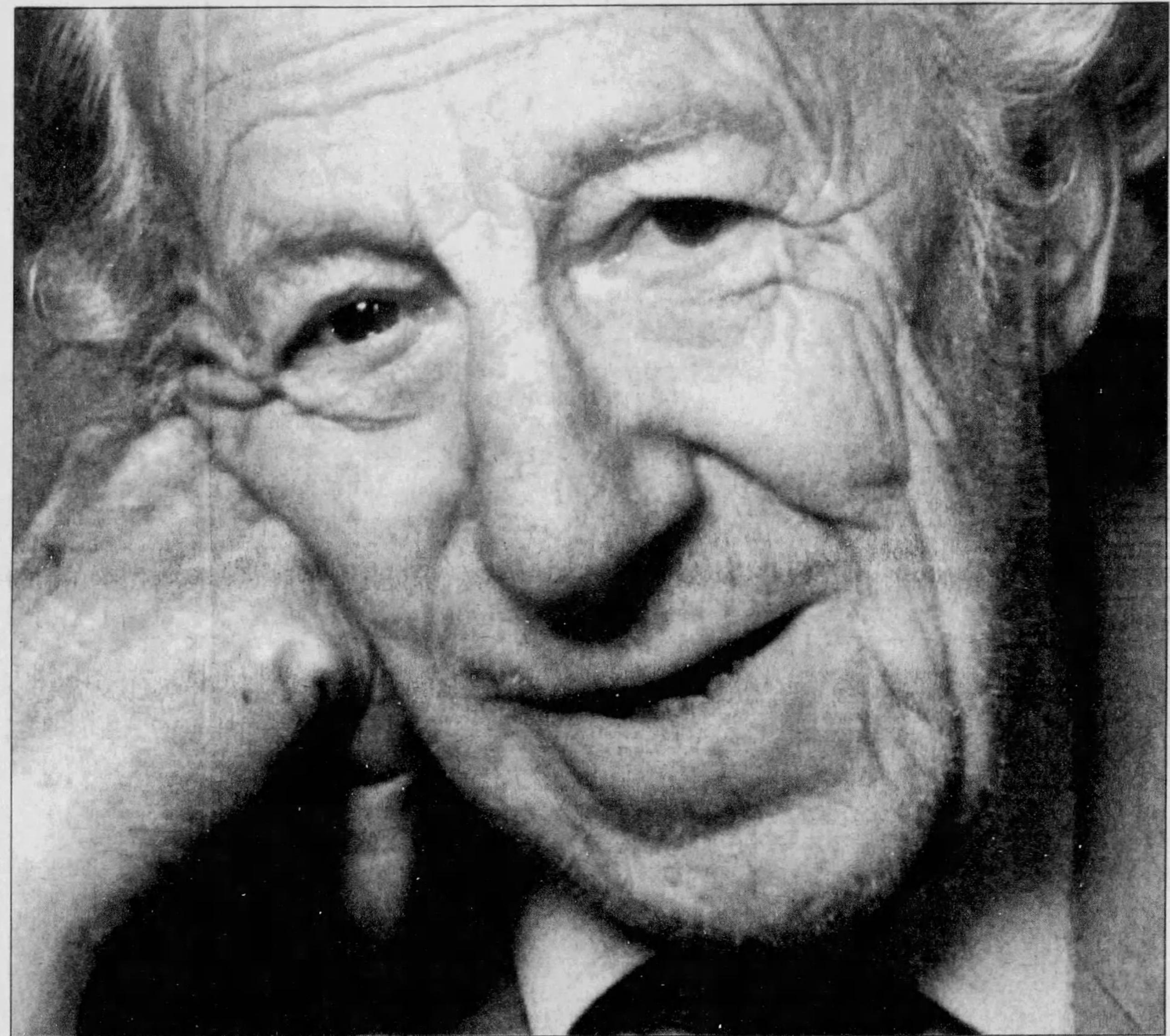
eorge Scott remembered her as a stylish, aristocratic woman in her early 70s. She said she was a pianist, a graduate of Harvard University. She also happened to be a psychiatric patient at the Ontario Hospital in Brockville.

It was 1936 and Dr. Scott was a 21year-old University of Toronto medical school intern. His fascination with the human mind was about to lead him on a lifelong journey into the brave new world of psychiatry.

The piano player from the Brockville mental hospital was one of his earliest stops on that trip.

"She would always say to me 'graduate of Harvard brother, fire in the furnace brother.' I took an interest," Dr. Scott recalls.

He wanted to help the woman, so he looked into the hospital pharmacy and found a chemical derivative of



ROD MACIVOR, THE OTTAWA CITIZEN

One former patient successfully sued Dr. George Scott for sexually exploiting her. He still denies the charge.

cannabis, "the technical name for the drug that's in pot."

"I thought, 'I'll give it to the old lady.'

I got permission. It did help her in a

reverted to her psychotic state, Dr. Scott recalls. He considered it an experiment that "worked all right."

In the decades to come, George Scott would scale to impressive For four hours, the woman regained heights in psychiatry before a dramather ability to play the piano and then ic fall in 1995 that would see him

stripped of his medical licence.

He would open his own private hospital, he would become a senior staff psychiatrist for the Canadian penitentiary service.

See DOCTOR on page A2

## Gulf coast evacuated as storm closesin

Officials urge 1.5 million to flee as hurricane gathers strength

BY ALAN CLENDENNING

NEW ORLEANS - Hurricane Georges was headed for the Mississippi River Delta late yesterday after gathering strength in the Gulf of Mexico and leaving a trail of wreckage along the scenic Florida Keys.

More than 1.5 million people were ordered or urged to leave New Orleans and low-lying coastal areas. Bumper-to-bumper traffic lined up on Interstate 10 out of New Orleans. The American Red Cross set up 25 shelters to handle the evacuees. Schools were closed for tomorrow.

After killing more than 300 people in the Caribbean, Georges took no lives in Florida when it hit Friday. From the Keys, it was on a path across the Gulf toward New Orleans with 175 kilometre-an-hour winds. Hurricane warnings were posted along 530 kilometres of coast from Morgan City, Louisiana, to Panama City, Florida.

"This is kind of like looking down the barrel of a shotgun and hoping it turns," said State Police Lt.-Col. Ron-

nie Jones. The centre of the storm was expected to reach the mouth of the Mississippi River, about 120 kilometres southeast of New Orleans by tomorrow afternoon. When it hits, the storm could have strengthened into a socalled Category Three storm with

Forecasters said Georges could slow as it nears land, drenching some areas in Louisiana with more than 50 centimetres of rain. A storm surge of three to four metres was expected in many areas today or tomorrow.

winds above 175 km/h.

Georges is the most serious storm to threaten New Orleans since 1969, when Camille slammed into the coast of Mississippi and Louisiana, causing flooding as far north as Virginia and West Virginia, killing 259 people.

Much of New Orleans is below sea level, and the city is bordered by swamps, lakes and the Mississippi River.

tres of levees and 21 powerful pumping stations that suck storm water from streets and send it into drainage canals. But weather forecasters said the

The city is protected by 210 kilome-

hurricane will push sea water into southeast Louisiana's rivers, bayous and lakes, causing water levels to rise between four and five metres above tides that are already a metre above normal.

The so-called "storm surge" could cause Lake Pontchartrain and Lake Maurepas to overflow their banks. Both lakes border New Orleans and its suburbs.

See STORM on page A2

Aftermath: Georges leaves Key West battered, C8

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Weather: Rain. High 23, low 9. Page C8. Classified ads: 829-9321 Home delivery: 596-1950

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## Cancel Third World debt, churches urge

BY BOB HARVEY

Canadian churches are helping to kick off a worldwide campaign to persuade industrialized countries to write off the debts of the world's poorest nations.

Ottawa's Anglican bishop, John Baycroft, and its Roman Catholic archbishop, Marcel Gervais, will meet Finance Minister Paul Martin tomorrow to urge him and Commonwealth finance ministers to endorse the campaign.

Bishop Baycroft said cancelling the

Third World countries.

"One of the most dramatic effects would be an improvement in the health of children.

"It could also mean access to clean water and curing cases of blindness that can be fixed with simple opera-

tions," he said. Bishop Baycroft said many Third World nations are being crippled by debt payments mandated by the International Monetary Fund and the World Bank.

Experts estimate Third World coundebts would make it possible to save tries have already paid twice as much the lives of millions of children in to industrialized countries as the orig-

inal \$1.5 trillion they borrowed, and say that many of the debtor countries are effectively bankrupt.

Since the debts were first contracted in the 1960s and 1970s, the economies of many Third World countries have been devastated by a dramatic drop in the prices paid for their commodities and the soaring price of oil.

The campaign to cancel the debts of about 45 countries is now worldwide, and includes not only churches but relief organizations such as Oxfam.

See DEBT on page A4

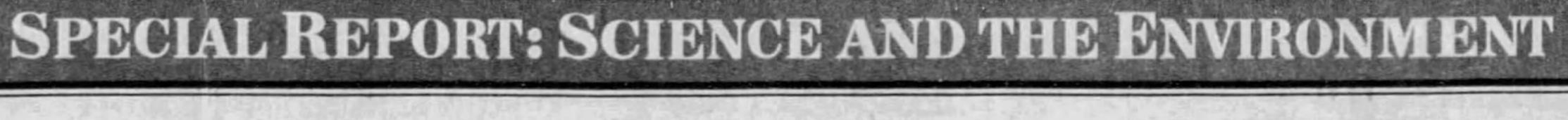
#### HOMER, SWEET HOMER

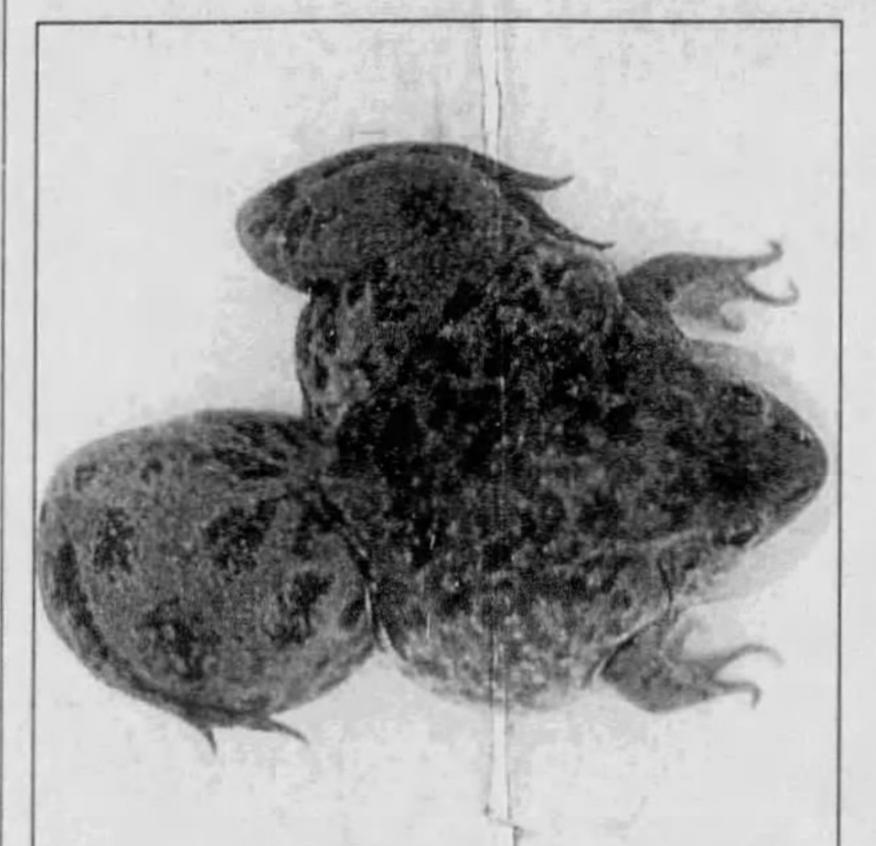
### McGwire ahead by two

St. Louis slugger Mark McGwire blasted his 67th and 68th homers to move two ahead of Chicago's Sammy Sosa in the home-run derby that has revitalized baseball.

And in Toronto, Blue Jay Roger Clemens didn't get the win but became the first back-to-back winner of pitching's triple crown since 1931.

Full baseball story, page C1





### Biological mystery

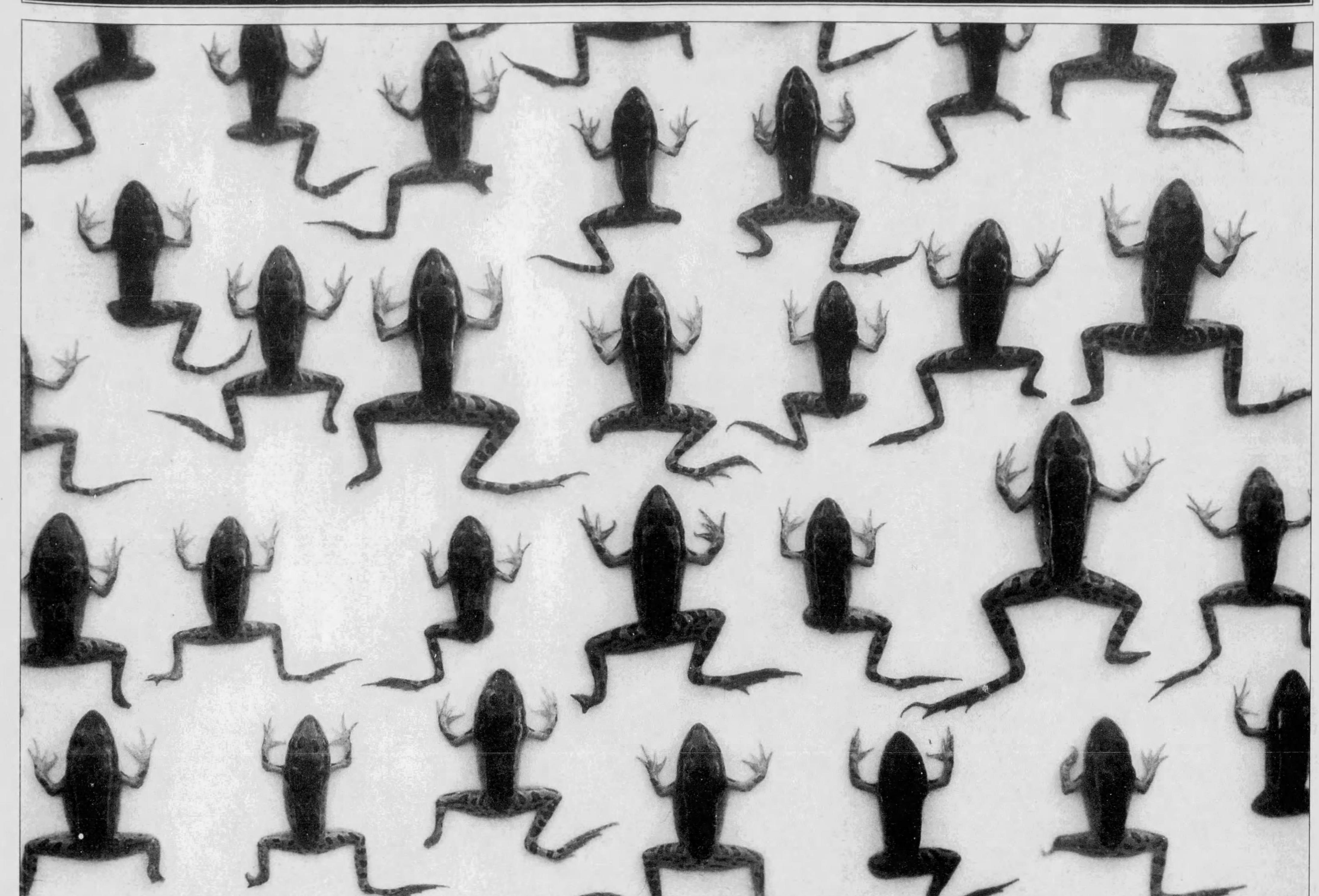
Grotesquely deformed amphibians such as the toad at left or the frog, right, with three eyes. Falling populations. What might be the cause? It's a mystery that intrigued Dr. Martin Ouellet, who set out to resolve it and to find out what it means to the people in the surrounding area. Because if the frogs and toads are sick, chances are the people may be sick too.

See stories, pages A6 and A7.



PHOTOS BY DR. MARTIN OUELLETF

#### SPECIAL REPORT: SCIENCE AND THE ENVIRONMENT



MARTIN OUELLET, THE OTTAWA CITIZEN

Scientist Martin Ouellet gathered these deformed leopard frogs this summer from Raymond Greffe's yard and neighbourhood, beside a cornfield near the St. Lawrence River.

# What have we done to the frogs?

Notre-Dame-du-Mont-Carmel, Quebec

hen Raymond Greffe stepped out of his house in rural Quebec to mow his lawn in July, he expected to see what he always sees: Hundreds of tiny new leopard frogs hopping like mad to get out of his way. Instead, they were "crawling like

toads or just falling over in the grass." He picked one up. Part of its hind leg was missing. He picked up another

and another - 30 in all and 24 of them had a stump instead of a hind leg, or no hind leg at all.

All week he watched the frogs struggle. He didn't mow his grass for a month to give the frogs shade and cover from predators.

"I've been looking at nature since I was 12," says the aviation electronics technician, "and I never saw a robin eating frogs before. They were beating frogs against wood. The grackles were just walking in the grass and picking up frogs all over the place. The same thing for the crows."

He phoned the department of the environment and wildlife of Quebec. While he waited for someone to come to his house, in the little village of Notre-Dame-du-Mont-Carmel, 45 kilometres south of Montreal, he did some investigating. Was this misshapen population the result of one batch of genetically damaged eggs? But examination of frogs along a halfkilometre stretch up the road showed no difference. The 80-per-cent deformity average held.

"In the beginning I was looking for frogs that were deformed," he says. "After that, I looked for frogs that weren't deformed."

Don't, he says, ask if he was surprised. He already knew about the masses of deformed frogs in the U.S. But, most of all, as an environmentalist who lost many fights in the 1970s and 1980s, he was resigned. "I predicted years ago that the frogs would be the first to be attacked," he says, because they live in water as eggs and tadpoles and, particularly, because tadpoles breathe through their skin.

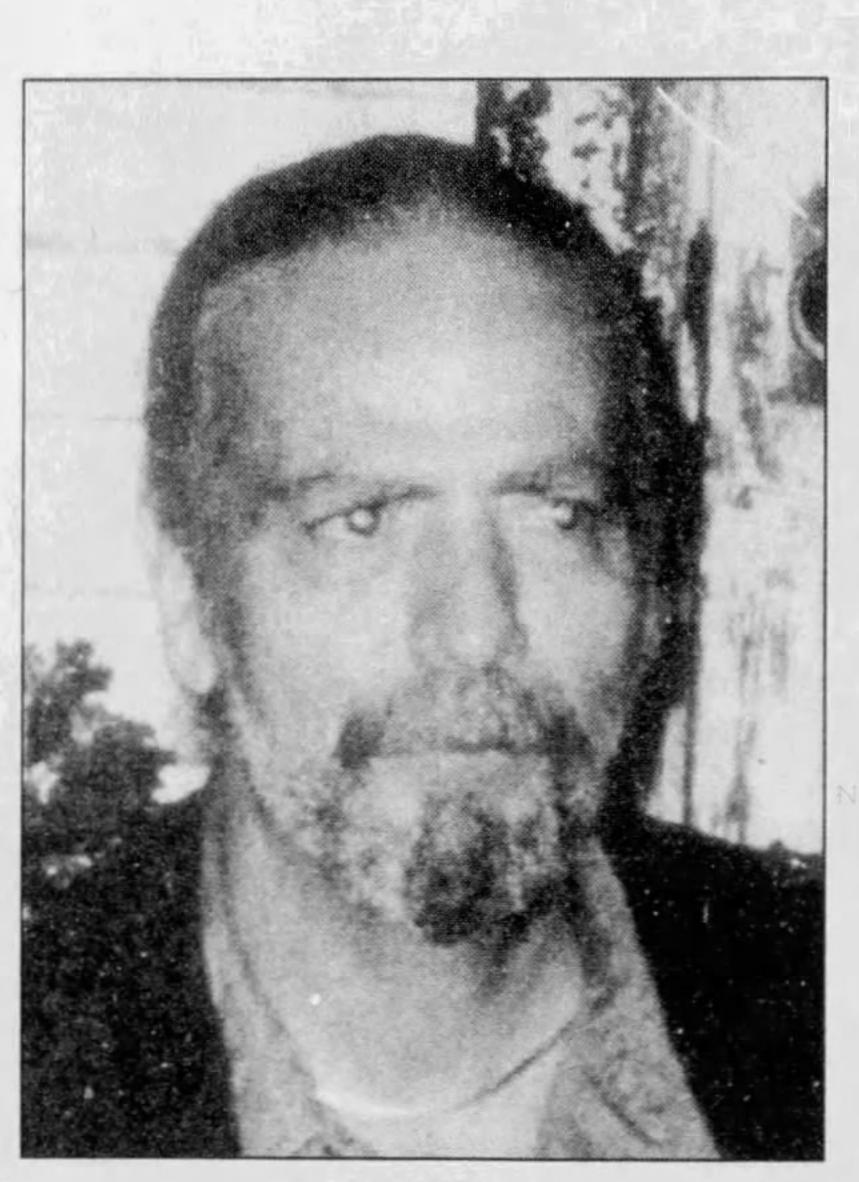
But he just didn't expect to find the calamity literally at his doorstop. "It's the quantity that scared me to hell. I thought I'd see it gradually come about. One year a couple, and the next year a few more. But it was all the babies around."

Danielle Guay, Mr. Greffe's friend, also spent many hours picking up frogs, documenting their missing and shortened legs. She lives in a neighbouring town, where she drives a school bus. She takes me on a walk down the lane that runs between Mr. Greffe's property and a very weedy pond that receives agricultural runoff from the field nearby.

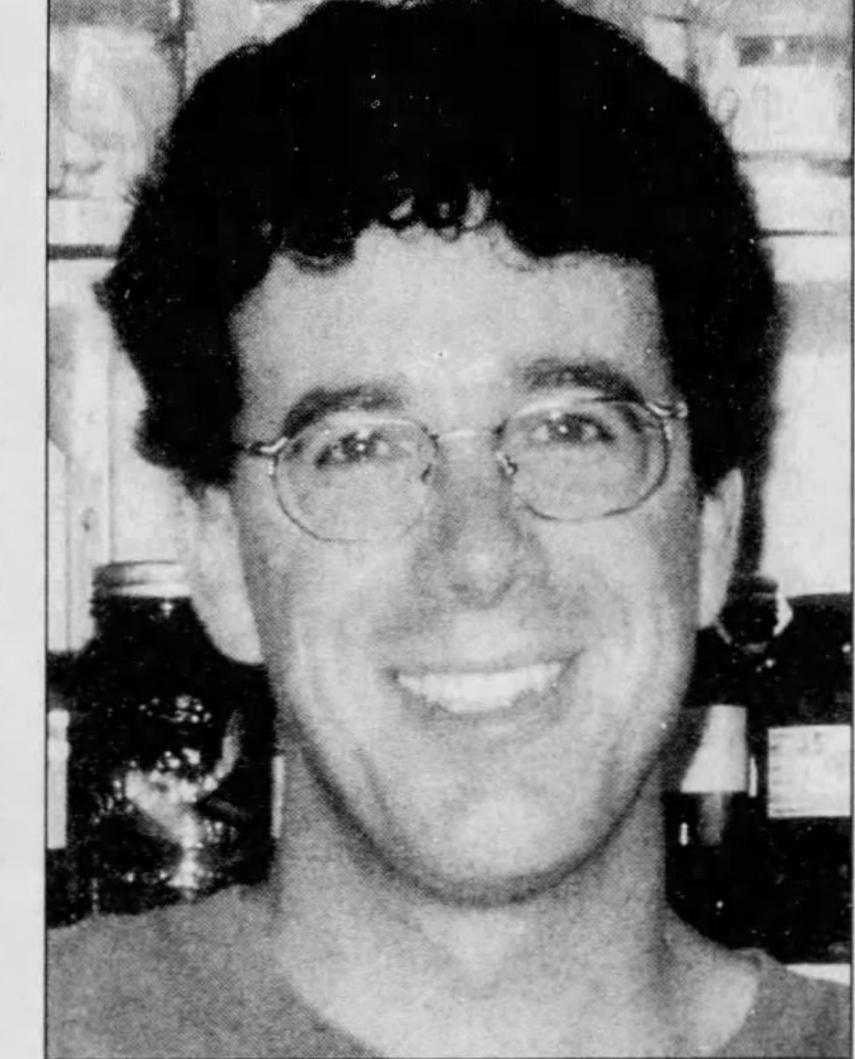
She has made a net to catch the frogs and captures eight frogs and two toads. One frog is missing part of a foot and two have only a stump at their hip. Gently, expertly, she extends their legs, notes their deformities and, murmuring to them, puts them back in the grass, "If the frogs are sick, the fish are also sick," she says, and more comfortable in French, she adds "Grenouilles malades, hommes malades (frogs sick, humans sick)."

In Mr. Greffe's own back yard, beside his cattail swamp, two young

An epidemic of deformed frogs in his back yard frightens Raymond Greffe. But what really worries him is why provincial and federal governments aren't more interested. Donna Jacobs investigates an environmental harbinger.







DONNA JACOBS, THE OTTAWA CITIZEN

When Raymond Greffe, left, and his friend Danielle Guay, centre, found deformed frogs all over the lawn, biologist and veterinarian Martin Ouellet came to investigate. "If it had been my goal to collect 1,000 (deformed) frogs that day," Dr. Ouellet says, "I would have been able."

frogs are disfigured, three older frogs are normal.

A few days later, Dr. Martin Ouellet, a veterinarian and specialist in frog deformities, visited Mr. Greffe. The environment department had contacted him because he has spent the past seven years looking for the cause of frog deformities.

"If it had been my goal to collect 1,000 frogs that day," he recalls, "I would have been able." The lawn earned his description of "hot spot."

"Every time you're catching two frogs, one is deformed," he says. "It's huge." He anesthetized and killed several frogs for this winter's work: autopsies and analysis of genetic abnormalities on the frogs he has collected all over southern Quebec.

They will form part of his database of nearly 30,000 amphibians, mostly frogs, but also some toads and salamanders. Among the 16 species he has studied, he has found 25 types of deformities - frogs with three legs, with 23 extra toes, with an eye placed on a shoulder or a back, with missing fingers and toes, legs or parts of legs.

The deformed frogs virtually all die, either from predators or disease. "They're handicapped. They have a hard time moving and when they fall, they have abrasions from gravel. The bacteria enter and they usually die from septicemia." This blood poisoning is a painful death, a total-body infection that causes them to swell up. "Of course, they're probably not comfortable," says Dr. Ouellet, who wants to avoid anthropomorphizing. "But they fall. They have nerves and muscles. If you do that to a frog," he pinches his skin - "they feel it. They have the same nerves that we

Martin Leveillé, a biologist with the environment ministry, accompanied Dr. Ouellet to see the frogs around Mr. Greffe's property. He described the sight as "bizarre" with hundreds of tiny frogs with uneven legs, making erratic jumps.

ous and jump very well," he said. "They don't seem to have much problem feeding." If a toxic substance caused the deformities and the frogs survive for two months after metamorphosis, their chances "seem quite good." He says that it would be upsetting if the deformities were the result of human activity, but noted that causes can also be natural. "That's why we

"These animals are still very vigor-

ties and money for water tests." The third person to visit the site, two weeks later, was Réal Normandeau, provincial agricultural technician. He spoke with Mr. Greffe and

have to be prudent," he said. "Next

year there will be budgets and priori-

'In the beginning I was looking for frogs that were deformed. After that, I looked for frogs that weren't deformed.'

Raymond Greffe

Ms. Guay. He looked at the frogs with Dr. Ouellet.

However, Mr. Normandeau did not take any water samples of the pond nearby where the frogs hatched, nor well-water samples from the nearby homes, nor a sample of water coming out of the large drainage pipe from the adjacent farm field. The pipe carries runoff from the farm fields, complete with fertilizers, herbicides, insecticides and fungicides that farmers have sprayed on their crops. He did not talk with the farmers nearby to see which pesticides they have used

this season. laboratory do samples and we're not sure if we have enough pesticide to produce good results," he said, noting that pesticides disintegrate. He added: "We're not sure pesticides are

the cause of the deformities."

He preferred, he said, to make a research proposal for next spring and summer rather than ask the provincial government to analyze a variety of water samples from that site in July. "What," he asked, "should we tell the lab to look for?"

Mr. Leveillé said he did not know what farmers typically spray on their corn and soybean crops but said that Mr. Normandeau would know. Mr. Normandeau said he didn't. He said, though, he will find out. "I will go back," he told the Citizen on Sept. 18.,

"in two weeks." In contrast, when Minnesota school children discovered deformed frogs during a school trip in 1995, it became an international story and set off a national and state emergency. Scientists tested pond and residential well water for pesticides, heavy metals, salt, pH levels — any agents that could cause genetic abnormalities. They're still testing. In May, U.S. Secretary of the Interior Bruce Babbitt convened a cabinet-level briefing on plummeting frog populations in the U.S., which led to the creation of the Task Force on Amphibian Declines and Deformities to co-ordinate federal research. (Its Canadian counterpart is the Task Force on Declining Amphibian Populations in

Canada.) This week, Mr. Babbitt announced a new coalition of government, environmental groups and children, and a new web site - www.frogweb.gov to find out what is killing and deforming frogs in the U.S. "When we consider that these creatures are hardy enough to have been on Earth for 350 million years," he said, "it is shocking to think that there could be a world without frogs."

This difference in response to his "We are not sure if we can have the own situation strikes Mr. Greffe: "No one cares about the frogs." He includes farmers, neighbours and the provincial department in charge of this sort of environmental emergency. Anyway, he says, government departments work at cross purposes.

Several years ago, the provincial government gave the neighbouring farmer permission to install a pump for his drainage system. Runoff now goes directly into the pond at the end of his corn field instead of draining into the ditch that runs the length of the huge field. The cattails in the ditch used to purify the water before it left the farm. "Everybody knows that aquatic vegetation cleans out polluted water," says Mr. Greffe. Runoff is choking out the wildlife with weed growth.

Both Mr. Greffe and Dr. Ouellet say that governments are reluctant to investigate farm chemicals and practices because it is big business, and because, in rural Quebec, the farm union is very powerful.

There were fewer frogs already, says Mr. Greffe, without the possibility of pesticide poisoning. In 1992, just as Dr. Ouellet began documenting deformities, the provincial government invented a new permit to provide a legal frog hunt. "You see how dumb things are: The year they put out a permit, there's less and less land and fewer marshes for the frog and now they have a permit that says you can take any quantity you want."

He says that, four years ago, bullfrogs had started to make a comeback in his area. "We were there at night and there were bullfrogs singing. It's so beautiful.

"One night, someone came by truck to catch the bullfrogs and you couldn't hear one the night after. The men were there all night. I put a note in their truck window. They never came back because they'd just cleaned the whole place out." Even this summer,

there are only a few bullfrog voices. The collectors supply restaurants with frogs, where only their legs are used, cut off at the hip and ankle. The other market is school and research laboratories. Frog hunters shine a light on the frogs — deer hunters call this jacking — which freezes them, or they wave a red flag with a hook on it, or they hit them with a dart.

Under provincial regulations, the hunting season in southern Quebec for bullfrogs, green frogs and leopard frogs is July 15 to Nov. 15. Hunting methods approved for use: nets, fish hooks, a blunt instrument for stunning, pits, barriers, darts and capture by hand.

Mr. Greffe explains the pit-barrier method. Frog collectors stretch a burlap fence along a pond, and at each end they dig deep holes. When the frogs come out of the mud after their winter hibernation and try to get to the water to breed, they have to hop sideways along the barricade. When they reach the end of the barricade, they fall into the holes.

If the frog population dives — and Mr. Greffe says there are fewer frogs now than even five years ago - the mosquitoes will lose their primary predators and this will create a problem in this cottage country. "Then we'll start spraying products that kill mosquitoes. That's how humans work. They don't look for the cause. They'll attack the results of what they did themselves."

Mr. Greffe says he'll protect the frogs as best he can. "The animals have no choice. Even these frogs that are sick are beautiful in a certain way."

### SPECIAL REPORT: SCIENCE AND THE ENVIRONMENT

# Pesticides: On the farm. In the fields.

After seven years of investigating the clues, researcher Martin Ouellet is ready to indict a culprit in the mass deformities and early death of frogs: pesticides used on the farm. Donna Jacobs reports.

T's a double biological murder mystery. What agents, possibly operating internationally, are horribly deforming so many species of frogs? And, what fate did all the other missing frogs meet?

Martin Ouellet, a 30-year-old veterinarian who left his small animal practice near Montreal, has devoted the past seven years to hunting down the answer. He has the world's largest collection of deformed frogs in his lab at McGill University's Redpath Museum. For every misshapen frog he collects, he examines and releases hundreds. "I don't want to take many," he says, "because they're already under so much pressure."

He and a team of Canadian Wildlife Service biologists, have now examined nearly 30,000 frogs.

He submits his photos into evidence. A frog with one eye staring out from its back. A frog with legs growing from its belly. A frog with three extra legs. A frog dragging itself along with stumps for hind legs or with hind legs fused. A frog missing an eye, or fingers or toes, or having extra digits, one with 23 extra toes.

His autopsy reports are equally chilling. Many frogs that looked normal outside were being poisoned to death inside by clogged and yellowed livers. Frogs that look like males are female inside. Lab results show altered DNA.

Even last year, Dr. Ouellet was circumspect in naming his primary suspects. He said he needed more proof before he could shift suspicion to accusation. Now, he is no longer hedging. The culprit, he says, is pesticides.

Although his data proves guilt by association, the only way to convict pesticides, he says, is to reveal the mechanisms that disfigure frogs and to reproduce these deformities in frogpond experiments.

He finds the grotesque frogs along a 250-kilometre stretch on both sides of the St. Lawrence River, from Montreal eastward to Montmagny, Que. Only a man who has spent many summer months bending over frog ponds in farmers' fields could speak so plainly.

He has catalogued 25 types of deformities among 16 amphibians — spring peepers, grey tree frogs, mink frogs, wood frogs, green frogs, pickerel frogs, northern leopard frogs, bullfrogs, American toads, eastern newts, mudpuppies, redback salamanders, blue- and yellow-spotted salamanders, northern two-line salamanders and northern dusky salamanders.

"We have to know why the frogs are deformed and why they are dying," says Dr. Ouellet. "We're also living in the St. Lawrence Valley and we put the food coming from there on our ta-

bles." Sometimes he finds the evidence left behind in plain view at the scene - empty pesticide containers lying right there in the water. Dr. Ouellet watched as one farmer, unaware that the scientist was photographing frogs nearby, cavalierly burned plastic containers at the edge of an irrigation pond. "All these ponds are used to irrigate fields, and sometimes they are chemical soup," he says. "We're eating the food so there is a big human con-

nection." His most dramatic findings: On agricultural land that has not been sprayed for many decades, an average of one frog in every hundred is deformed — ranging (depending on the site) from a zero-to-12 per cent deformity rates. On working farms that use insecticides, fungicides, herbicides and chemical fertilizers, an average of 12 frogs in every hundred are deformed - yielding zero-to-100 per-

cent deformity rates. In July, Dr. Ouellet surveyed a farm property near St-Charles, 25 kilometres southeast of Quebec City. There, every single frog he picked up was deformed — missing toes and parts of legs. The deformities occurred in three different species - leopard, mink and green frogs. Overall, this summer the news was bad: "There were fewer frogs but way more deformities."

Jean Rodrigue, a CWS biologist based in Ste-Foy, Que., has been Dr. Ouellet's frequent field-research partner. When Dr. Ouellet presented their earlier findings, scientists challenged the data based on a small sample size of a few thousand frogs. "After seven years, we are finding exactly the same pattern but the sample size is huge and very hard to criticize." On the spreadsheets of his enormous database, probably the largest field study in the world, each frog has its own line.

That means the PhD candidate will spend an intense winter in data analysis to find the common instruments in the deaths and deformities.

The Canadian contribution is significant amid the increasingly crowded field of scientists who, worldwide, are working flat out to solve the riddle. However, the usual scientific curiosity has taken on a sense of urgency for at least three reasons.

First, some frogs are already on the threatened-species list in several countries, including Canada.

Dr. Ouellet's academic supervisor is David Green, a professor of biology at McGill and former national co-ordinator of the Canadian Declining Amphibian Populations Task Force. Among Canada's 45 frog and toad species and 21 salamander species, according to Dr. Green, 17 are in decline. Several of those are designated as vulnerable or threatened species, mostly among western species, because of human activities: encroachment, farming and logging practices. (For years, Canadian farmers have received attractive subsidies from the public purse to drain their lands for cultiva-

Mass deformities have not caused all of the global population declines. Individual populations cannot thrive, however, when every other frog is abnormal. Severe deformities sentence young frogs to an early Darwinian death, which explains why Dr. Ouellet never finds a grossly misshapen adult

Second, amphibians are an important "sentinel" for the health of water, soil and air. Frogs are particularly susceptible during their dramatic, hormone-driven change from waterbreathing tadpoles to air-breathing frogs. Some frogs, such as mink frogs, green frogs and bullfrogs, spend two or three years in breeding ponds as tadpoles, perhaps the single reason they show particularly high levels of deformities.

Third, hormone-disrupting chemicals which play havoc with master glands and organs, such as the thyroid and liver, have raised alarm among scientists. One particularly suspect class of pesticides are retinoids, compounds derived from Vitamin A, known to produce birth defects in humans and other vertebrates. Hormone disruption often affects the thyroid, which directs a huge number of body functions, from metabolism to sexual development, and the liver, which is crucial for filtering out environmental contaminants and toxins in the blood. Researchers are looking at human health — at increases in prostate and

#### 'We have to know why the frogs are deformed and why they are dying.'

Dr. Martin Ouellet

breast cancer, at declining human fertility, at abnormal sexual organs in children — and sensing a pattern.

Research done in Canada, California, Iowa, Nebraska, Minnesota and Finland shows that children of parents who work or live in farm settings have more deformities. These include: fused fingers and toes, missing fingers and toes, deformed arms and legs and abnormal hearts, kidneys and sexual organs. Mothers who work in agricultural industries are more likely to mis-

carry or have stillborn children. "There are big problems going on out there," says Dr. Ouellet. "The frogs are probably trying to tell us something, so it's probably important to lis-

Already, in some rural areas in Canada, the once-deafening sound of is down to a few voices.

People talk to Dr. Ouellet about it. "People all over the place say, 'I remember going to that pond when I was a kid and there were tons of frogs' or 'I remember when it was so loud it was impossible to sleep. Now it's hard even to hear one frog singing."

While deformities naturally capture headlines and the public's attention, they may be the least severe situation. "If there's too much toxicity and the eggs die," says Dr. Ouellet, "you will have no frogs at all."

Scientists and nature lovers are already dreading the season that some of them believe is quite close: the long Silent Summer.

Some researchers blame the steep decline in frog populations on UVB rays blazing through a thin ozone layer and destroying genetic material in eggs and tadpoles. For others, the culprit is an affliction: a frog virus, bacterium, fungus or parasite.

Only Dr. Ouellet openly points to pesticides: "We have very incriminating results."



JOHN MITCHELL, THE OTTAWA CITIZEN

Dr. Martin Ouellet searches a marsh at night. He and Canadian Wildlife Service biologists have spent many summers doing fieldwork.

The more circumspect Mr. Rodrigue is amused by his colleague's outspokenness. "I guess it is incriminating. But of what?"

These two men have spent months of their lives catching frogs; some days start at 4 a.m. and end at 8 p.m. They work in rain, swatting bugs and mosquitoes. Dr. Ouellet holds the record for examining 1,058 frogs in one day.

Pressed to speculate about causes, Mr. Rodrigue says only that he has a feeling that the problem lies with insecticides. Whenever he sees a strawberry field or a potato field, he is pretty sure the nearby pond will hold a high percentage of deformed frogs. (In potato fields whose ponds produced deformed frogs, the scientists have documented use of the herbicides metribuzin and diquat and the insecticides phorate, azinphosmethyl, cypermethrin, oxamyl and chlorothalonil, and the fungicide mancozeb.)

Strawberries are known to carry the highest load of pesticide residues: "Wash your strawberries very well,"

about whether and which pesticides because of inconsistencies, the pristine ponds with five per cent of the frogs deformed and the working farm ponds with no deformities. He's waiting for their data to presents the an-

Dr. Ouellet says he also expects to see deformed frogs in ponds next to corn fields. (Some farm ponds with deformed frogs are next to corn fields sprayed with the herbicide atrazine and the insecticide carbofuran; both have hormone-disrupting effects on wildlife.)

Both men criticize the practice of farmers who remove vegetation around their farm ponds and who mow their fields right to the water's edge. This gives pesticides a direct, unfiltered runoff path into the ponds. Some farmers actually spray the water, itself. In both cases, this violates the "buffer zone" clause — specific pesticide distances from water — detailed for some farm chemicals.

In Mont-St-Hilaire, however, the researchers have a huge experimental "control site." The two small mountains, formed by ancient volcanoes and now owned by McGill University, has been declared a biosphere by the United Nations. It's located 45 kilometres east of Montreal, on the St. Lawrence River's south shore and it's a remnant of the environment before pesticides. In a world where pesticides ride on air currents for thousands of kilometres, of course, there is no truly pristine place left on earth.

However, having never had a direct application of farm chemicals, Mont-St-Hilaire bolsters Dr. Ouellet's damnfrogs peeping and bullfrogs croaking ing conclusion about pesticides. Among the 7,000 frogs and salamanders he and student assistants Linda Paetow and Roxane Petel examined there, only 10 had deformities - all

mild limb malformations. Fifty or 60 years ago, another generation of researchers had catalogued the 16 native frog species and other amphibians and reptiles that lived there. Pristine or not, Mont-St-Hilaire now has fewer frog species — two frog and three salamander species are missing altogether. The old specimens, stored at the Redpath Museum and at the Museum of Nature in Ottawa, provide a comparison of frogs from the dawn-of-pesticides era with those from today.

Amphibian deformity is not a new phenomenon. Mysterious mass deformities have been documented for some 300 years. And the growing file on deformed frogs now, particularly in Quebec, Vermont, Minnesota and California, reflects the increase in the number of scientists looking for them. Dr. Ouellet's work in agricultural areas, with students Jonatan Blais and

#### Web sites

Web sites with photos or text on deformed and declining frog populations in North America

http://www.sciencenews.org http://www.cciw.ca/ecowatch/ dapcan http://www.npwrc.usgs.gov/ narcam

www.frogweb.gov

Patrick Labonté, contrasts with the typical wildlife biologists who work in "nice wetlands and don't go into a corn field, which is not fun to sample. It's disgusting. There's a little water, a cornfield, pesticides. It smells."

If, when the answers are in, the culprit is whole families of pesticides, the Canadian and U.S. governments may indeed ban their use. Then, says Dr. Ouellet, pesticide companies will just develop new products which, in a decade or two, But he won't draw conclusions will also be proven harmful. "Whatever the mechanism, pesticides are always toxic in the end," he says flatly. "That's why they work. Some will disrupt hormones, some will cause direct mortality, others will cause limb deformities."

He looks to DDT as a perfect example of a chemical with proven toxic effects on wildlife and humans. Banned in 1972, its metabolite, DDE, remains in the soil and wildlife even now. Nevertheless, he says, pesticides companies "sell it like crazy" in Africa, South America and Asia because it's a cheap compound and it's not banned there.

For Dr. Ouellet, the solution is in natural biological controls and restoring the natural cycle where healthy populations of birds, frogs and dragonflies, and microscopic predators, suppress crop-chewing insect populations. He believes this counter-revolution begins not with the farmer, but with the consumer, that is, everyone who eats. A pesticide-free apple with a yellow spot, a crooked carrot, a lopsided, imperfectly red tomato are natural. People would be more willing to buy them, indeed, one day may go looking for them, when they know the true cost of picture-perfect produce.

In 1998 alone, Minnesota committed \$1 million to frog deformity research - after school children found deformed frogs on a 1995 field trip. The sum discourages this Canadian team which is working with a 1998 grant of \$25,000 from the Canadian Wildlife Service and occasional grants or free services offered by a coalition of McGill, the University of Montreal and the Quebec ministry of the environment. The scientists don't have enough money to pay for lab tests. One frog autopsy, one chromosomal analysis and one pond water analysis would cost, says Dr. Ouellet, more

than \$1,000. The huge discrepancy in funding strikes the veterinarian as doubly ironic. "We're in worse shape than the U.S.," he says. Canada's climate dictates cultivation along its warm southern border, farming that is more concentrated and pesticide-consuming. And, he says, as governments cut research funds to pay for health care, they may be paying for human diseases from the environmental contamination the researchers are trying to document.

Dr. Ouellet and his colleagues are the only Canadian scientists doing a large-scale investigation of this mystery. Wherever they've looked, they've found deformed frogs. And Dr. Ouellet's "take home message" is that if he were looking anywhere else in Canada for deformed frogs, he would find them there, too.

These photos by Dr. Martin Ouellet show typical frog deformities. He has documented 25 types in his study of 30,000 amphibians.











