

Yale Medicine



The med school's
largest grant

4

Yale launches stem
cell program

7

Making a better
knockout mouse

18

winter 2007

Water is life

A LETTER FROM NIGER

24



WINTER 2007

CONTENTS

ON THE COVER

Takat and Aminata, Tuareg girls from Camp Tantigellay Teckniwen, fetch water from a marsh contaminated with animal and human waste, and load it into a bag on a donkey. Water flows only a few months of the year in the Azawak plains of Niger in western Africa. During the dry season inhabitants spend most days in search of water.

BACKGROUND

Aminata, a Tuareg girl, fetches water from a marsh.

Photographs by Ariane Kirtley

- 2 **This just in**
- 4 **Chronicle**
- 8 **Rounds**
- 10 **Findings**
- 12 **Books & Ideas**
- 16 **Capsule**

- 18 **Little mouse, big science**
Geneticist Tian Xu has found a way to make knockout mice quickly and cheaply. By finding genes and discerning their functions, he hopes to find cures for gene-related disease.
By Pat McCaffrey

- 24 **Water is life**
An EPH alumna works to bring water to the remote Azawak region of Niger, where drought is devastating a traditional, nomadic way of life.
By Ariane Kirtley, M.P.H. '04

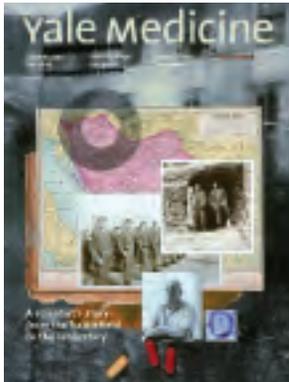
- 30 **Fever, internal medicine and Paul Beeson**
During his 13 years as chair of internal medicine, Paul Beeson turned the department into one of the best in the country.
By Richard Rapport, M.D.

- 36 **Faculty**
- 38 **Students**
- 40 **Alumni**
- 46 **In Memoriam**
- 48 **Follow-Up**
- 48 **Archives**
- 49 **End Note**

On the Web

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New state stem cell fund awards \$7 million to Yale investigators

As *Yale Medicine* was in production, Yale scientists received \$7 million in grants from the State of Connecticut Stem Cell Research Advisory Committee in November to study aspects of stem cell biology. The grants were the first awarded from the \$100 million fund established by the state last year to promote stem cell research outside the restrictions of federal funding. The state also awarded grants totaling \$12 million to investigators at the University of Connecticut and \$900,000 to scientists at Wesleyan University. The total allocated for 21 research projects was \$19.78 million. A state advisory panel awarded the grants after reviewing 70 applications. (See related story, page 7.)

The lion's share of the Yale funding went to Michael P. Snyder, PH.D., professor of molecular, cellular and developmental biology, to investigate the neural differentiation of human embryonic stem cells. He received \$3.8 million.

Haifan Lin, PH.D., director of the Yale Stem Cell Program, received \$2.5 million to support a human embryonic stem cell core facility. The University of Connecticut received a similar amount for its core facilities as well. Diane S. Krause, M.D., PH.D., associate professor of laboratory medicine and pathology and co-director of Yale's stem cell program, received \$856,653 to study a leukemia gene using human embryonic stem cells.

Yingqun Joan Huang, M.D., PH.D., assistant professor of obstetrics, gynecology and reproductive sciences, received \$200,000 to study the Fragile X mental retardation protein in early human neural development. Eleni A. Markakis, PH.D., assistant professor of psychiatry, received \$184,407 to direct the isolation of neuronal stem cells from human embryonic stem cell lines. And Erik Shapiro, PH.D., assistant professor of diagnostic

radiology, received \$199,975 for using magnetic resonance imaging to study the directed migration of endogenous neural progenitor cells.

"With this first allotment of money, Connecticut becomes a national leader in the area of stem cell research," said Gov. M. Jodi Rell in a statement announcing the grants. "We have proven ourselves able to provide a place where such research can be done safely, ethically and effectively, in addition to providing investment dollars for the growth of the bioscience industry in Connecticut and making an investment intended to improve the health of generations to come."

Five other states—California, New Jersey, Maryland, Missouri and Illinois—have decided to fund stem cell research.

"After careful consideration and review by both an international panel of experts and this committee, we are confident that Connecticut is investing in stem cell research projects that will yield significant scientific findings in the long term," said J. Robert Galvin, M.D., M.P.H., chair of the state's Stem Cell Research Advisory Committee and Commissioner of Public Health.

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Water, a jumping gene and Paul Beeson

This past spring we heard from Ariane Kirtley, M.P.H. '04, who grew up in Africa and returned there after her graduation. Our cover story—her account in words and photographs—describes the life of the Tuareg and Woodabe inhabitants of the Azawak, the remote and drought-stricken plains in Niger where life is a constant search for water. But Kirtley is not content with simply documenting living conditions there—she has also formed a foundation to help build wells in the region and save not only lives but a pastoral way of life as well.

Closer to home, Tian Xu, Ph.D., professor and vice chair of genetics, has found a faster and cheaper way of making knockout mice. It involves a transposon, a “jumping gene” from a moth that can be inserted into the mouse genome, and a complex process that allows the laws of genetics to run their course with a little tweaking from human hands. This first transposon to be effectively used in mammals allows scientists to knock out known genes and discover others previously unknown. Freelance writer Pat McCaffrey spent some time with Xu to learn how

he hopes to use his technology to help scientists find the causes of disease on a grand scale.

Last August we learned of the passing of Paul B. Beeson, M.D., who served as chair of internal medicine from 1952 to 1965. During his tenure he hired new faculty, inspired his staff and residents and built the department into one of the best in the country. Renowned internationally as both a scientist and clinician, Beeson made fundamental contributions to the understanding of fevers and infectious diseases. Richard Rapport, M.D., author of *Physician: The Life of Paul Beeson*, has graciously allowed us to excerpt sections of his biography that deal with Beeson's time at Yale.

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SECOND OPINION BY SIDNEY HARRIS



"A PROBLEM WITH THE PHASE II TRIALS... EVERYONE — ALL 480 PEOPLE — WAS GIVEN THE PLACEBO, AND NO ONE GOT THE DRUG."



A LETTER FROM NIGER

Water is life

The 500,000 inhabitants of the Azawak plains of Niger wage a daily struggle to find enough water for their basic needs. Through her photographs, an alumna of epidemiology and public health hopes to draw attention to their plight and improve their lives.

Text and photographs by Ariane Kirtley, M.P.H. '04

In the Tuareg camp of Tchintaloukan, 18-year-old Againakou gives her 10-month-old son, Agoubouley, a drink of marsh water. Such water can be deadly—10 of 120 children in another camp visited by author Ariane Kirtley died of diarrheal diseases caused by drinking the water.



When I threw a pebble into Mohammed and Gonda's well, I heard a faint thump, not the splashing of water. "How deep is it?" I asked. Two hundred feet, I was told, and no sign of water.

For six years Mohammed and Gonda's families from neighboring villages and camps in the Azawak plains of the Republic of Niger pooled their resources to dig an adobe well. Then they abandoned their efforts. There was no more money to dig deeper or to line the well with cement—the adobe well threatened to cave in. Even if the families had had the resources, it would take six more years to reach water. In the Azawak the first water table typically lies 430 feet underground, and renewable aquifers are at 700 to 1,400 feet. Because the people of the Azawak cannot afford pumps and pipes, there are few sources of water, and none are permanent or reliable because they dry up from overuse.

Finding water occupies the lives of the 500,000 members of the Tuareg and Woodabe Fulani ethnic groups who make their homes in the plains' 200,000 square kilometers. Most of the year there is no water. During the rainy season from July through September, the pastures turn green, the animals grow fat, milk is plentiful and water overflows from marshes that reappear after nine months of drought. The water, fouled by animal and human waste, may be darker than coffee and dirtier than a New York City mud puddle, but people drink and bathe to their hearts' content. Dysentery and diarrhea soon follow.

While in the Azawak, Kirtley stayed with families in their homesteads, camps and villages. In January 2006, during a Muslim festival, she posed with children of Tantiqellay Teckniwen, a Tuareg camp.

Most of the inhabitants of Niger's Azawak plains belong to the Tuareg and Fulani ethnic groups. Pastoralists, they graze livestock, driving them as far as 350 miles in search of water. Author Ariane Kirtley describes the region as a "rich and diverse land of extremes: extreme kindness, extreme heat, extreme beauty and extreme challenges."

When the marshes dry up, people travel by foot or donkey to find water. Prevented by local populations from settling near the few sources of water that exist on the outskirts of the territory, they repeat their search every day. The men travel up to 350 miles south seeking water for their livestock, and the search for water becomes a daily chore for women and children. Children as young as 9 or 10 may travel—with temperatures topping 100 degrees—10 to 17 miles to the nearest well, only to wait for hours for their turn to fetch water. Often their turn comes too late, as the other people and their livestock sharing the well have left it dry. The children may stay at the marsh as long as three days while the water is replenished.

Water consumption in these plains, less than a gallon and a half per person per day, is well below the World Health Organization's recommendation of 6.5 gallons. During the dry season, water is reserved for drinking and cooking—personal washing awaits the return of the rains. In the Azawak almost half the children die before their fifth birthday.

Despite the hardships, people stay in the Azawak. It is their traditional home, but on a practical level, they have no place to go. Their numbers are too large for relocation, and moving elsewhere could lead to strife with other ethnic groups.

Finding water

Although I spent the first 10 years of my life in Africa, I had never seen an area as poor as the Azawak. With my brother





and our *National Geographic* journalist parents, I lived among the nomadic Bozo fishermen in Mali, the Ibadite Muslims of central Algeria, the animist Gueré “panther men” of western Ivory Coast and the Inadan Tuareg artisans of Niger’s Air Mountains in the Sahara Desert.

I studied public health at Yale and for my internship returned to Niger to work on a hygiene and sanitation program with CARE. After graduating in 2004, I went back to Niger as a Fulbright Scholar to build upon my work with CARE. My Fulbright research revealed significant variations in knowledge, attitudes, behaviors and resources relating to health and nutrition among seven ethnic groups living in rural Niger. (For example, of 700 men I interviewed in the Azawak, only three had heard of AIDS, and all three believed it resulted from women having sex with dogs.) With this information I created a database that allows health organizations to tailor their programs to their target populations’ unique needs and attributes.

During my Fulbright research I discovered the Azawak. My research assistant, Moustapha, whose family had abandoned the plains during the drought of 1974, persuaded me to visit his homeland. Little did I know that my visit in September 2005, which was to last only a month, would consume me professionally ever since. I spent October and November 2005 attempting to interest humanitarian organizations in the Azawak. With a team of Nigerien employees from a large international humanitarian agency,

we wrote a proposal to fund a water and food program. It was rejected because the Azawak is “too vast and remote”—the organization did not want to risk its employees in a region without water.

Realizing that I had to take the first step if humanitarian aid is to reach the Azawak, I have founded Amman Imman, which means “water is life” in Tamachek, the Tuareg language. Amman Imman has been raising money since February 2006, with a goal of \$280,000 for a pilot program to build two borehole wells, each of which could provide water for 25,000 people. With more funding, we hope to sink even more such wells. Once water is available, humanitarian organizations may safely send workers to improve the lives of one of the most vulnerable populations on earth. (More information about the project is available at www.waterformniger.org.)

The people of the Azawak

Most people of the Azawak are pastoral nomads of the Tuareg and Woodabe Fulani ethnic groups. The Tuaregs of the Azawak have retained a nomadic existence, herding cattle, camels, goats and sheep, and living in tents of red-dyed goat hide in camps of 50 to 150 people. During the rainy season, they move every three to four days in search of pastures. In the dry season they move often within their “home territories,” land occupied by their families for generations.



Gonda and Mohammed spent six years trying to dig a well, with money raised from their Tuareg families and neighbors. They abandoned their efforts over a lack of money and worries that the well would collapse.

Throughout her travels in the Azawak, Kirtley captured images of daily life and portraits of the Woodabe and Tuareg peoples.



The Woodabe are nomadic cattle herders who live in camps of one or two families and move frequently to greener pastures. Their homesteads consist of a traditional wooden bed (covered with a plastic sheet when threatened by rain or sun) and a wooden table covered with 20 to 30 calabashes—bottle gourds hollowed out and dried for use as containers. Only a few of these calabashes hold grain or milk—the rest are on display as a sign of the woman's wealth.

Sedentary villages grow more common as drought takes its toll on livestock. Without animals for their livelihood, the nomads settle into villages of between 100 and 300 people and try to survive through subsistence agriculture, mostly growing millet and sorghum. But even they abandon their villages to search for water during the harshest months of the dry season.

Hospitality and hope

Sadouan was the first to greet me as my research assistant, Moustapha, and I arrived at our Tuareg host camp in September 2005. She invited me to her tent, prepared a traditional bed of large wooden poles and woven mats, and gave me a mosquito net and elaborate leather pillows for armrests.

Late into the night her relatives came bearing bowls of camel milk. Sitting on a pillow and sipping the frothy liquid, with Moustapha as my interpreter, I had a conversation with Sadouan's husband, Alhassan. The camp and its herds, he said, had recently returned from salt licks in the north. He

lamented losing 80 percent of his herd to drought that year. "Around 100 of my camels died because they didn't have enough food and water. When we ourselves had no more food, we also had to eat some of them. I sold others to buy millet for Sadouan and the kids," he said. "Ten years ago, only the poorest families in our camp owned fewer than 300 animals. With only 20 animals left, what can I count on to survive? Maybe if I grow enough millet this year, we'll have enough to eat."

After putting her children to bed, Sadouan gently ran her fingers through my hair. "Why haven't you braided your hair?" she asked, implying that she would never leave her hair uncovered and unbraided. "If you want, I can wash it with ochre, and give you the festivity braids."

A wild harvest to fill empty bellies

The sun was setting as I arrived in the Tuareg village of Intatolen to greetings from men and women returning from a day planting millet. Two women waved me over to their thatched hut to share their supper of wild squash and a grain I didn't recognize. After several minutes of silence, I introduced myself and asked their names. They giggled. I had committed *senti* by speaking while eating. A faux pas in Tuareg tradition, *senti* is nonetheless covertly appreciated as a sign that the food was so good that it made your mind wander from matters of etiquette.

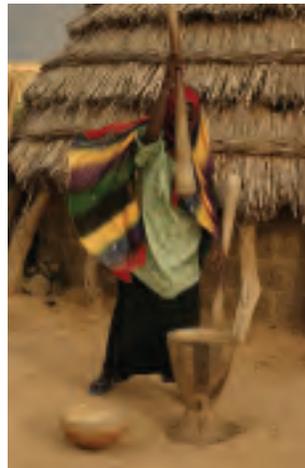
"We would have liked to serve you meat, but all our animals have died," said Issibit, the elder of the two co-

RIGHT Tackawel, a Tuareg woman who lives in a sedentary village called Intatolen, pounded grain in September 2005. Many inhabitants of the Azawak are turning to raising grain instead of livestock in order to feed their families.

FAR RIGHT Muddy marsh water is all that's available for drinking, bathing, cleaning and washing dishes. In September 2005 in Tanti-gellay Teckniwen, a Tuareg woman, Zeinabou, washed her bowls.

OPPOSITE LEFT The Woodabe, a subgroup of the Fulani ethnic group, move their camps of one or two families every two or three days. Their homesteads include a wooden bed, which they cover with a plastic sheet when it rains or the sun is too harsh.

OPPOSITE RIGHT In the region of Inagar in January 2005, a Woodabe Fulani family moved camp with their belongings carried on donkeys.





wives, after dinner. “We ran out of rice a few weeks ago, and so now we are eating wild grains until they too run out. And the *lacada*, we are *very embarrassed* to have served you the wild zucchini, but we have nothing else to eat.”

I later learned that eating wild grains and vegetables is a sign of famine—they are eaten only when every other food source has run out. My research revealed that 71 percent of the households that I interviewed went from eating one or two meals a day supplemented with milk to one or no meals a day, sometimes supplemented with far less milk. And 91 percent reported resorting to eating wild grains, squash and bitter berries.

From school to Guerwuls

Fada, about 14, adorned with charm talismans, a round feather-topped hat and a Tuareg saber, came bouncing toward me as I struggled through prickly burrs. “Hey, follow me, I’ll show you where it’s best to step,” he said. “Come to my camp. It’s just over that dune.” Two hours and about 2,000 prickly burrs later, with a herd of long-horned cows following, we arrived at his home: a wooden bed and a table covered with calabashes.

The camp was deserted. “Oh, I forgot—everyone has left to prepare for the Guerwul tomorrow.” I had heard of Guerwuls, beauty competitions held by the Woodabe people, a subgroup of the Fulani. “Can you come?” Fada asked.

I asked Fada about life as a herder. Had he ever been to school? At first he laughed and then answered that the

Fulani reject formal education because they believe that schools steal their children away from their pastoral lifestyle. A child who attends school is considered dead because he or she no longer understands magic or the art of herding.

This is how Fada’s uncle, Ali, came to go to school 35 years ago. French colonists demanded that his grandfather, the chief of his camp, send the children to school in Tchintabaradène, the capital of the Azawak. He sent only his own grandchildren to their “death,” Ali among them. Ali ran away and hid in the bush for three weeks, traveling by foot through unknown prairies. When he reached his camp, the white men were waiting. He ran away five more times before accepting his fate. Ali never returned to life as a herder. Instead, he traveled to Morocco and France to obtain a degree in sustainable agriculture. Ali now works on crop productivity projects for a nonprofit organization in southern Niger.

After I refreshed myself with a bowl of curdled cow milk and promised to see Fada at the Guerwul, he said, “I’d like to go to school someday and become like my Uncle Ali. Maybe when I have children, there will be schools in the Azawak for them to attend.” **YM**

Ariane Kirtley, M.P.H. '04, grew up in Africa and has founded the nonprofit organization Amman Imman to build permanent water sources in the Azawak region of Niger.





Save the Date! June 1 - 2, 2007

- 1942 65th
- 1947 60th
- 1952 55th
- 1957 50th
- 1962 45th
- 1967 40th
- 1972 35th
- 1977 30th
- 1982 25th
- 1987 20th
- 1992 15th
- 1997 10th
- 2002 5th

Yale School of Medicine
Alumni Reunion Weekend
Reminisce with classmates.
See what's new.
Stroll down Cedar Street.
Reconnect.

Classes ending in 2 and 7 will be holding special celebrations this year.
All alumni are welcome to attend Alumni Reunion Weekend.
To learn more about this year's program, please call (203) 436-8551
or visit our website at <http://info.med.yale.edu/ayam>