THE MAGAZINE OF THE
CANADIAN INSTITUTE FOR ADVANCED RESEARCH

REACH
MAGAZINE

WINTER 09

WHERE HAVE ALL THE

WOMEN GONE?

PLUS

NEW SUPERMATERIAL MIGHT BUMP THE SILICON OUT OF SILICON VALLEY

DONORS HAVE MANY REASONS FOR SUPPORTING CIFAR

IN THE QUANTUM WORLD, SEEING IS UNDERSTANDING

REACH
MAGAZINE

WINTER 2009
VOLUME 9, ISSUE 1

The Canadian Institute for Advanced Research supports the work of hundreds of researchers across Canada and around the world. Currently, CIFAR supports 12 major multidisciplinary programs. Those programs are:

Cosmology and Gravity
Earth System Evolution
Experience-based Brain and Biological Development
Genetic Networks
Institutions, Organizations and Growth
Integrated Microbial Biodiversity
Nanoelectronics
Neural Computation and Adaptive Perception
Quantum Information Processing
Quantum Materials
Social Interactions, Identity and Well-Being
Successful Societies

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Reach is a magazine for researchers, volunteers, friends and supporters of the Canadian Institute for Advanced Research, and anyone else with curiosity and imagination. Published twice per year, *Reach* celebrates advanced research and explores the issues, opinions and ideas emerging from this work. We invite all comments or inquiries concerning the content of *Reach* and/or the work of CIFAR.

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Lost and Profound

If ever there were doubt that knowledge is power, the main feature in this issue of *Reach* should put it to rest.

In many parts of the world, the lives of girls and women are cut short in vastly greater numbers than those of their male counterparts. This phenomenon results in a demographic shift that has come to be described as the "missing women" problem, and it is the central matter discussed in this magazine.

The term "missing women" leaves the impression that women – hundreds of millions of them – were simply there one moment and gone the next. Siwan Anderson has dug deeply into this mystery to reach some troubling conclusions. She has discovered that many commonly accepted truisms about missing women do not stand up to scrutiny. The issue is larger and more complicated than anyone had previously understood.

Dr. Anderson's research involves a great deal of mathematics, statistics and demographic analysis. The use of these technical tools should not disguise the fact that the story of missing women in India, China and Africa is a story of loss and tragedy. The scale of this loss of human life can only be described with inconceivably large numbers.

The inequalities and injustices that lead to girls and women dying at such disproportionate rates to men can be changed. Such change requires a deep understanding of the issues and complex causes behind the phenomenon of missing women. Dr. Anderson's research is beginning to give us that understanding.

Dr. Anderson's research makes me proud of this organization. The story demonstrates that advanced research can create important new knowledge that makes the invisible visible and gives humanity the power to right wrongs. This is just one example of the power of advanced research.

If you agree that asking and answering questions of this sort can help us improve lives and understand one another better, please consider donating to CIFAR. Join the hundreds of individuals, companies, foundations and governments that make research like that of Dr. Anderson possible.

Knowledge truly is power, and with your help, CIFAR can continue to bring potent new truths to light.▪

Chaviva M. Hošek, O.C.
Lawson Foundation Fellow
President and CEO
Canadian Institute for Advanced Research

Monkey experience, monkey do

When a group of people entered the home of some young Rhesus monkeys, reactions were very mixed – not among the humans, but among the monkeys.

One group crowded the front of the cage and some even reached through the bars to grab at visitors. They behaved this way the entire visit. A second group froze when the visitors appeared, then resumed their normal behaviour at a cautious distance and with a watchful eye. A third group was visibly anxious; these monkeys moved as far away from the visitors as possible and clung to each other for comfort. Such differences are not simply a reflection of personality – they reflect the influence of upbringing.

Experience-based Brain and Biological Development program member Steve Suomi studies these monkeys – he investigates how genes and environment influence brain development and behaviour. Dr. Suomi hosted a visit to his primate laboratory as part of the program's fall meeting in Washington, D.C.

Dr. Suomi's group of young monkeys exhibit distinct types of behaviour because they grew up in different early environments. The curious monkeys have a lot of experience with humans and have surrogate mothers with a past record of high success with their own offspring. The cautious monkeys, however, are raised by their own mothers, and the monkeys that kept their distance are raised by their peers.

"The power of the contrasting behaviours was astounding. We really witnessed first-hand the profound effects of early experience on primate behaviour," says Kara Spence, CIFAR's Vice-President, Advancement and Communications, who was on the tour.

CIFAR is working to open up more of its researchers' laboratories to donors and special friends of the organization. Watch for announcements at www.cifar.ca/events.

CIFAR's passage to India

Renowned particle physicist Pekka K. Sinervo will join the Institute this spring in the newly created position of Senior Vice-President, Research. Although his official work is yet to begin, Dr. Sinervo is already building new international research partnerships for CIFAR in India.

Dr. Sinervo led a 10-day CIFAR delegation to meet with senior Indian government officials involved in science and technology, as well as senior administrators and researchers at ten of the leading Indian research institutions. The goals of the visit were to build on CIFAR's existing engagement with Indian researchers, develop a more extensive network of contacts in India and to discuss future collaborations and partnerships.

"Much of the discussions focused on the younger researchers, with significant interest from Indian institutions in the CIFAR Junior Fellow program," says Dr. Sinervo. Other possibilities include short-term visits of students in CIFAR researchers' laboratories and in workshops, or other "one-off" meetings that could be arranged in collaboration between CIFAR and Indian researchers.

The delegation left India with a list of potential initiatives to further deepen CIFAR's engagement in India. A more formal program of support for CIFAR-initiated activities in India and elsewhere is now under development. A follow-up visit is being planned for the next year.

Nanoelectronics program charged with renewal

"We perceive that the relatively modest amount of funding CIFAR provides to sustain this program is phenomenally well-leveraged to the benefit of some of the best scientific research talent in Canada."

So wrote the review panel that conducted the *Nanoelectronics* program review last spring. The program was renewed for another five-year term. All CIFAR programs undergo this rigorous process, conducted by an arm's-length international panel of experts. The goal of the review is to assess the continuing intellectual quality and vitality of the program.

"There are many possible approaches that can be taken to attempt to quantify the *Nanoelectronics* program's success over the past five years. Among the highlights: there were a phenomenal number of publications from the program membership, 920 in five years, with roughly a third in high-profile journals," the panel report stated. "Many of these represent collaborative works spawned by CIFAR interactions."

"WE PERCEIVE THAT THE RELATIVELY MODEST AMOUNT OF FUNDING CIFAR PROVIDES TO SUSTAIN THIS PROGRAM IS PHENOMENALLY WELL-LEVERAGED TO THE BENEFIT OF SOME OF THE BEST SCIENTIFIC RESEARCH TALENT IN CANADA."

Photo by Jason Dziver
Courtesy of iCORE

IN THE QUANTUM WORLD, SEEING IS UNDERSTANDING

Barry Sanders is a physicist and member of CIFAR's *Quantum Information Processing* program. With a team of animators and scientists, Dr. Sanders recently produced a four-minute animation that represents a physicist's mental movie of quantum computing.

The mere mention of the word "quantum" sometimes kills a conversation. Understandably so – in the strange and counterintuitive quantum world, an object can be in two places at once, a particle's state changes merely by dint of being observed, and something can be simultaneously a particle and a wave.

Dr. Sanders uses this movie to bring quantum computing to life – he opens a window that anyone can look through into a world that is still largely understood only by a handful of experts. And if the concepts remain elusive, these strange and beautiful images still capture some of the mystery and excitement of this subatomic world.

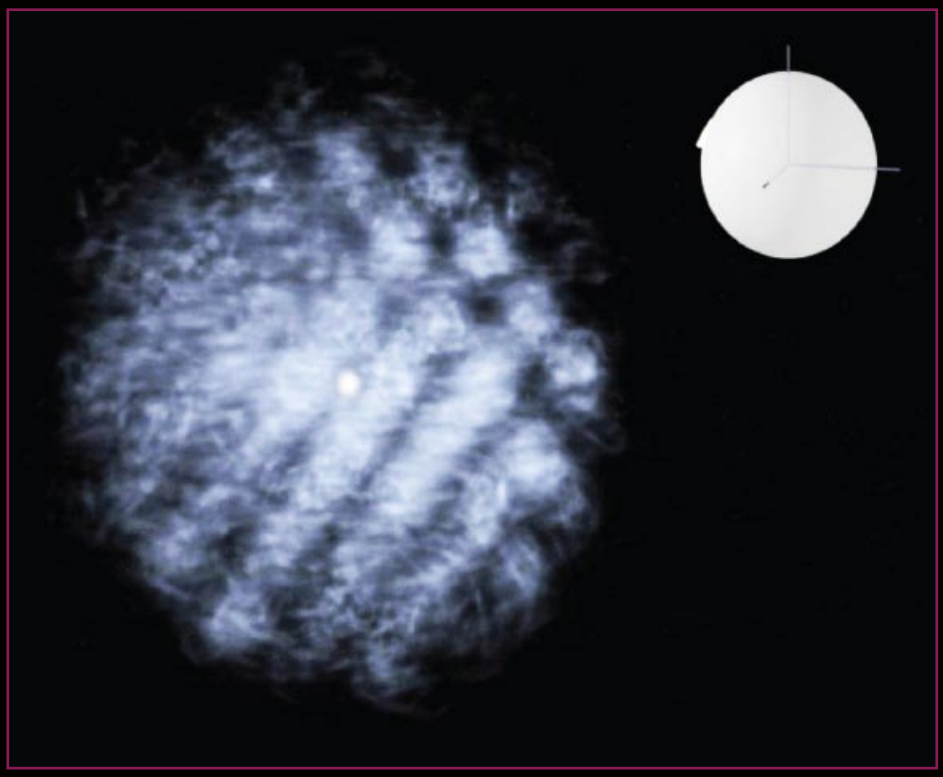
Here are some of the movie's most intriguing images, with explanation in Dr. Sanders' own words. >

THE QUBIT CLOSEUP

Quantum computers use a basic unit of information called a qubit. The qubit, like so many quantum phenomena, is difficult to describe using anything other than advanced mathematics. I wanted to create an image that would help people have some sense of what a qubit really is.

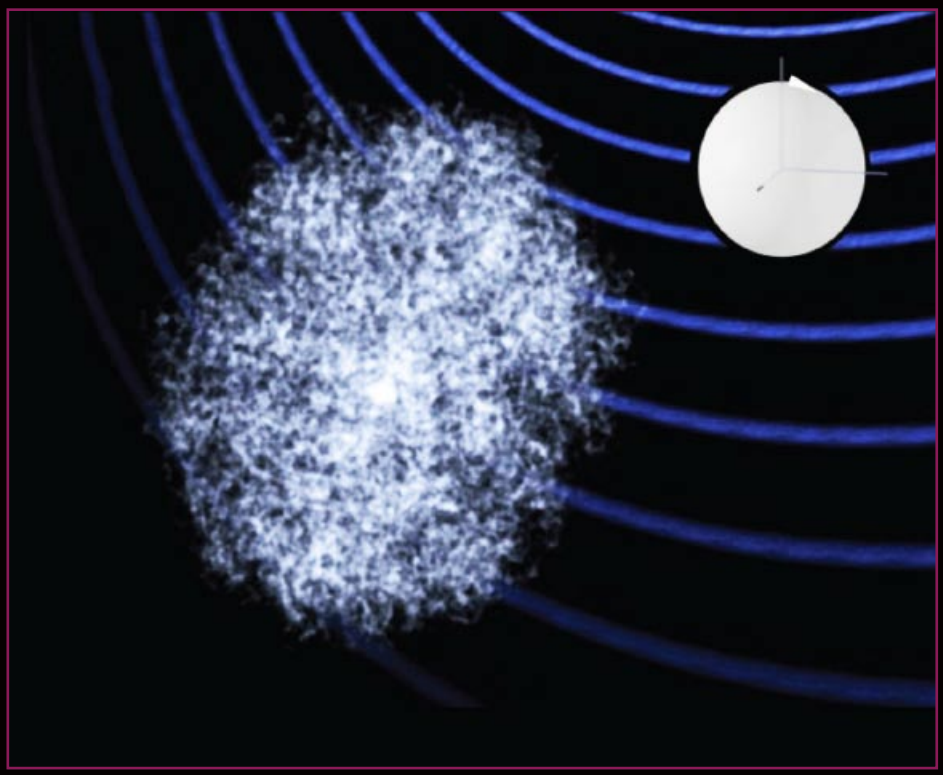
This is a picture of a neutral phosphorus atom. It has quantum computing power because it carries a single negatively charged particle – an electron. In the magnetic environment of a quantum computer, this electron becomes a qubit. Information is stored in the electron's quantum state – in things such as its position and spin.

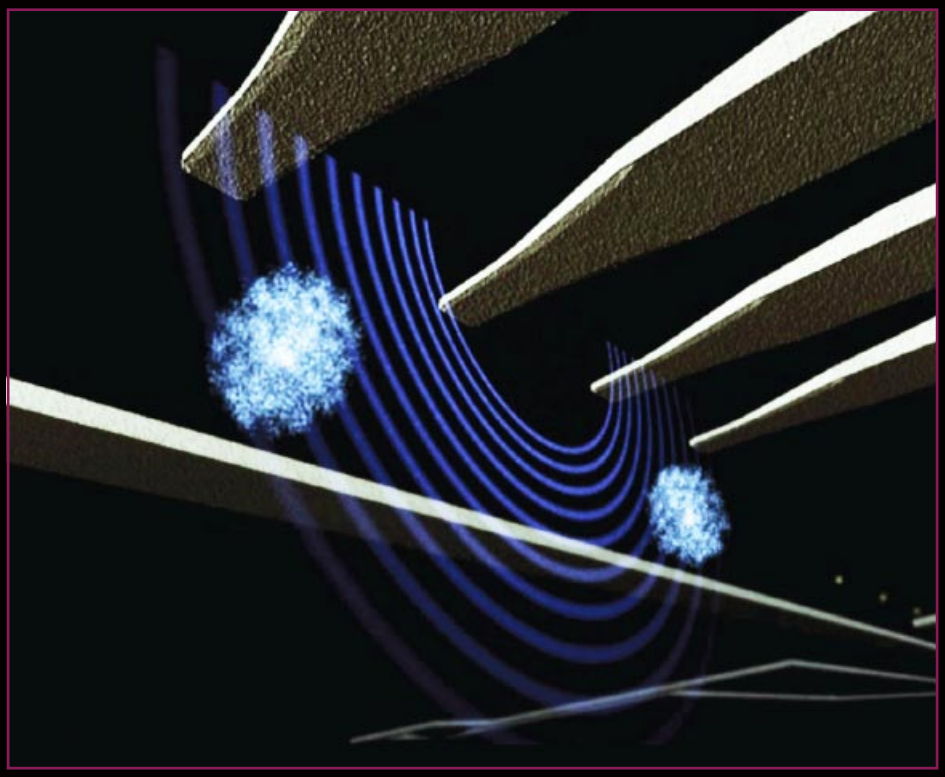
Due to the nature of the quantum universe, you can't see the electron as a clearly defined object in this illustration. The cloud in the image shows the electron's probability of being in a particular place. The sphere in the top right corner shows its spin. (The spin can be either up or down, which is analogous to the on or off of a switch in a classical computer. But at the quantum level, the qubit spin can also be simultaneously up *and* down.)



QUANTUM CONTROL, ONE QUBIT AT A TIME

For a quantum computer to successfully transmit information, it must first be able to control the quantum state of each qubit. Electricity is the key to this control: The blue lines in this image represent a local electric field hitting the qubit and controlling its spin.





A GATED QUANTUM COMMUNITY

In any computer, information needs not only to be stored, but also transmitted. I used the "diving boards" in this illustration to represent metal structures that control the electric field around the qubits, guiding information from one place to another.

This wider view of the quantum computer reveals a pair of qubits interacting via this electric field. Gates between the qubits act as single electron transistors: The gate mediates if and when the qubits interact and communicate. Interaction occurs when electrons in the clouds of each atom collide, allowing an electron to move from one qubit to another. The gate only allows interaction according to strict, predefined criteria. For instance, the gate might only allow an electron to move to another phosphorus atom if the electron's spin is up.

CLOSING THE LOOP

Zooming out even more, we can now see a snapshot of the full quantum computer circuit in operation. The lines represent the gates and each blue dot represents a neutral phosphorus atom holding a qubit, the electron. These qubits are busy transferring quantum information. Between the blue dots lie invisible, ionized phosphorus atoms that don't hold a qubit (which means they do not carry a single electron).

For more of Dr. Sanders' explanations, and to view excerpts of the animation, visit www.cifar.ca/quantum.

NEW SUPERMATERIAL MIGHT BUMP THE SILICON OUT OF SILICON VALLEY

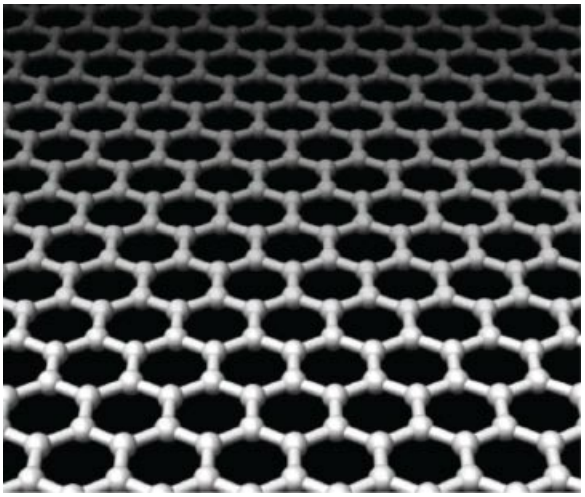
By Alison Palmer

Nanoscientists have unveiled a new supermaterial that could make our everyday electronics smaller and faster than ever. This amazing new material descends from the stuff at the core of that most humble of everyday communications devices: the pencil.

This supermaterial is made of graphene, which is a building block of graphite. Not only is graphite the basis for the writing implement of choice for schoolchildren and crossword puzzle solvers worldwide, it is also a form of nature's most basic building block: carbon. Carbon comes in many forms, from diamonds to charcoal, and each different form comes with unique and powerful physical properties.

"Graphene is a layer of graphite the thickness of a single atom. It is flat and transparent, and has wonderful conducting properties. Researchers only recently discovered the exciting potential of this material," says Thomas Szkopek, a member of CIFAR's *Nanoelectronics* program.

Some researchers view graphene as a promising replacement for silicon in microchips; its thinness opens the door to what they call the "ultimate level of miniaturization" for computer chips. At extremely small scales, silicon microchips start to leak electricity. Graphene transistors, however, perform better the smaller they become. With perpetual demand for smaller, faster, more energy efficient computing devices, graphene may allow researchers to go where silicon would never let them.



Graphene is a single atomic sheet of carbon atoms arranged in a honeycomb lattice, often produced by exfoliating a single layer of atoms from the surface of graphite.

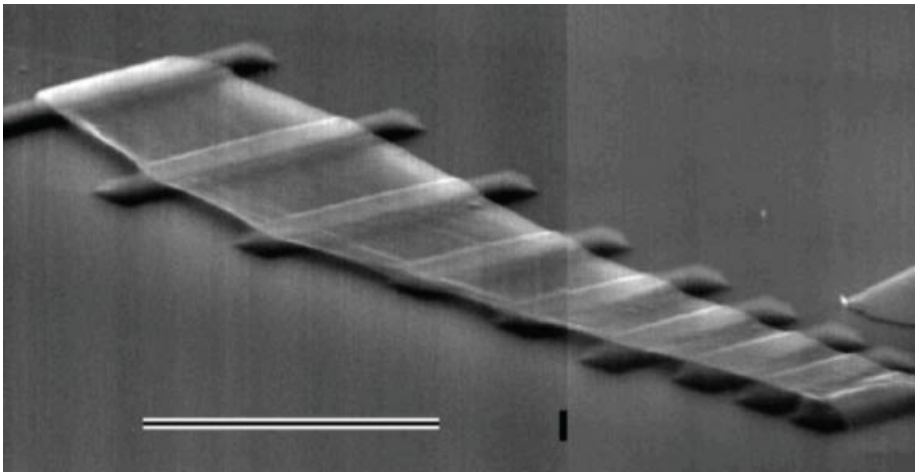
Image: Thomas Szkopek

Of course, you won't be throwing out your silicon computers tomorrow: Most researchers agree that graphene will have a huge role in the computer industry, but not immediately. Graphene research only started to explode four years ago – the first commercial chips won't likely roll off the conveyor belt any time soon.

In the meantime, though, graphene shows potential to be used in LED displays, and solar panels. The materials currently used for these applications are expensive and difficult to produce.

With great potential comes great challenge.

In order for graphene to be a viable replacement for silicon, it would have to be produced using a similar manufacturing system. Graphene appears compatible with the method currently used to make silicon microchips – stamping them out from large wafers – but thus far, no technique exists to produce large enough graphene sheets. The biggest graphene wafer obtained to date is 1/10th of a millimeter. Nonetheless, many researchers are confident that they will soon be able to multiply that wafer size one hundred-fold.



Graphene sheets can be suspended over bars of plexiglass. Image: Josh Folk.

Another challenge to realizing graphene's potential for fabricating microchips is its lack of an "off" state. The transistors that power electronics must have both on and off states in order to amplify and switch electronic signals.

Allan MacDonald, an advisory committee member of CIFAR's *Quantum Materials* program, thinks that the key to solving this issue is to isolate more complex forms of graphene. He is looking at graphene bilayers, materials that contain two layers of graphene stacked on one another. These bilayers do have an "off" state. His research group is investigating whether the conductance in bilayers is as good as in single graphene sheets.

Several other CIFAR researchers are working on graphene as well. Six months ago, Dr. Szkopek and *Nanoelectronics* members Andy Sachrajda and Josh Folk embarked on new graphene research.

Dr. Sachrajda's group is working on preliminary graphene devices, while Dr. Szkopek's group is studying noise in graphene transistors. Program Director Peter Grütter recently announced that his program is seeking a Junior Fellow to do postdoctoral work with the trio of researchers. The successful candidate will be based at UBC with Dr. Folk.

Although all three researchers share a passion for graphene, they have different views on when (and whether) it will actually bump silicon out of the microchip industry.

Dr. Szkopek suspects that the takeover might never happen. He sees graphene being used for high frequency applications, such as in advanced communications (where semiconductors such as gallium arsenide currently dominate), television and computer display technology, and solar cells. He notes that gallium arsenide was considered a hopeful candidate to take over silicon several years ago – yet this never happened.

> "PUTTING PRESSURE ON RESEARCHERS TO HELP TURN GRAPHENE INTO MICROCHIPS IGNORES ALL THE OTHER EXCITING PHYSICS THAT GRAPHENE IS CAPABLE OF AND ALL THE BIG QUESTIONS THAT IT MIGHT HELP ANSWER."

Dr. Sachrajda, on the other hand, is optimistic that graphene will play a role in the microchip industry.

"Carbon nanotubes received similar attention years ago. Their promise may not have been realized, but the challenges of working with graphene will be far fewer if an effective fabrication technique is found," Dr. Sachrajda says.

Dr. Folk, on the other hand, fears that all the excitement about graphene's computing potential might obscure its promise for pursuing knowledge for its own sake. He and many of his colleagues work on graphene simply because there is so much to learn from it. They are studying how to coat it with different metals and gases, stretch it, make balloons out of it, and stack it into bilayers. He believes that the most fascinating aspects of this material may turn out to be the ones nobody has discovered yet.

"Putting pressure on researchers to help turn graphene into microchips ignores all the other exciting physics that graphene is capable of and all the big questions that it might help answer," says Dr. Folk.▪

WHERE HAVE ALL THE

WOMEN GONE?

By Alison Palmer

As many as 200 million women and girls around the world are demographically "missing" according to the United Nations. "Missing women" are those who – all things equal – should be alive but aren't. The inevitable conclusion is that all things are not equal.

In cultures where boys are preferred, selective abortion and infanticide are known to lower the numbers of females. China and India have the most prominent reputation for this gender bias at birth and for the mistreatment of young girls. But despite their similar numbers of missing women (1.73 million in China and 1.71 million in India in the year 2000 alone), these two countries' stories are very different from one another. In many ways, India has more in common with sub-Saharan Africa. The story of this third region is less well-known for the issue, but women are missing there on the same scale as in the two Asian countries (1.53 million missing women in the year 2000).

Siwan Anderson wondered whether there was more to the story of missing women. Dr. Anderson is an economist and a member of CIFAR's *Institutions, Organizations and Growth* program. Using data from the United Nations and World Health Organization, she and her colleague discovered that, while gender bias at birth does exist, it only accounts for a fraction of the colossal numbers of missing women.

"Our estimates suggest that excess female mortality is a much more universal phenomenon than previously thought," Dr. Anderson explains. "We find that the majority of missing women disappear at an adult age, when parental preferences for male children should not be having a direct role."

Dr. Anderson's analysis reveals that a large number of missing women in India and China died as adults. (66 per cent in the former, 45 per cent in the latter.) There is, indeed, more to the story.

The concept of missing women was first presented in 1992 by Nobel Laureate Amartya Sen. He used sex ratios to determine absolute numbers of missing women. He estimated the numbers for each country by calculating how many extra women would be alive were they receiving "similar care" to men, as happens in most developed countries.

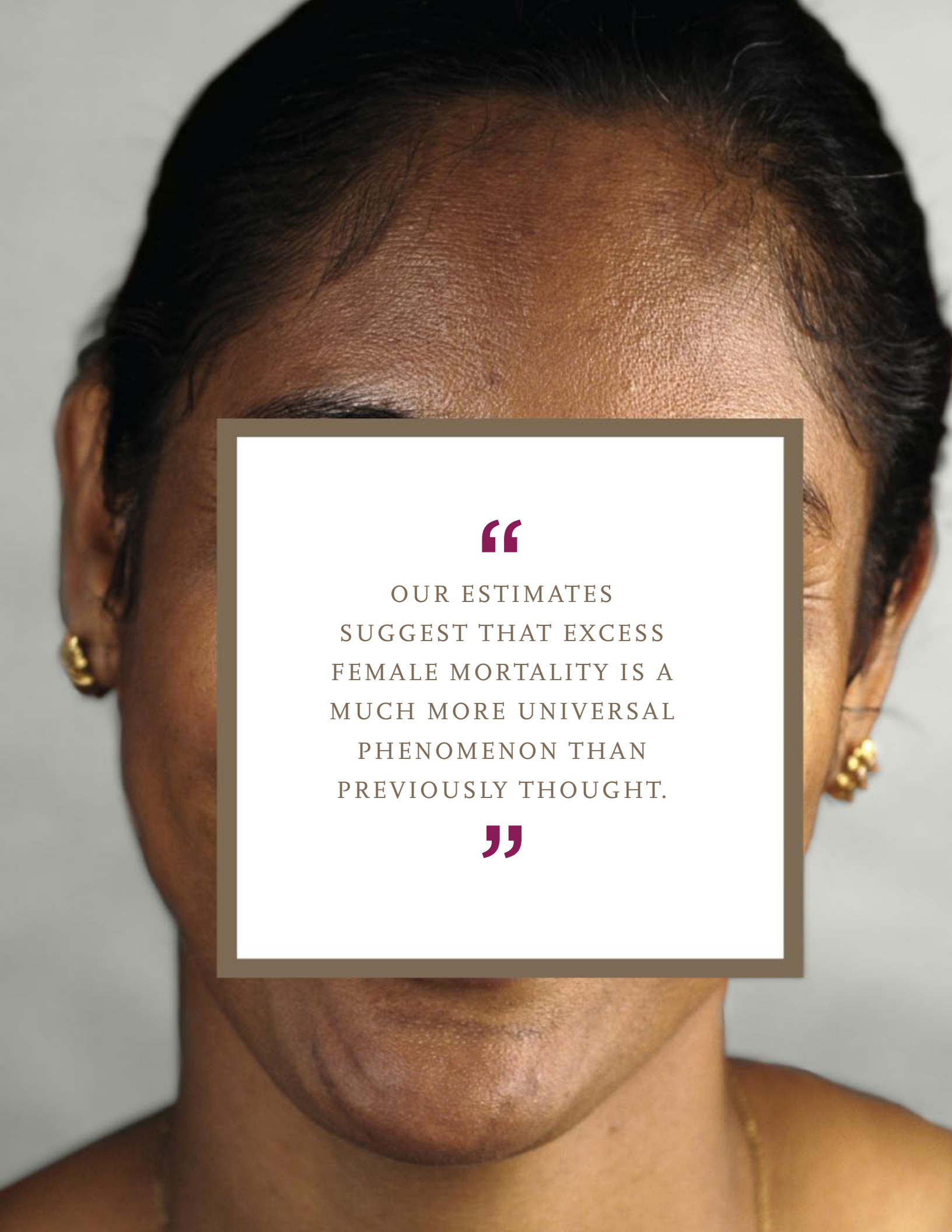
The term "similar care" can be interpreted in many ways. In addition, many other factors also influence the high incidence of female death. Take the case of HIV/AIDS in sub-Saharan Africa. The vast numbers of women dying of HIV/AIDS are not solely a reflection of a lack of similar care. Relative differences in cultural and sexual norms are major factors as well – men as a group are vastly more promiscuous than women, and as a result, many more women get infected and die.

Non-contagious diseases can also complicate the story. In the case of cardiovascular illness, a common killer of women in India, excess female deaths may result from unequal treatment, but also from differential incidence and genetic susceptibility between males and females.

Dr. Anderson sought to unravel some of these complexities. She identified the causes of female death in different age categories, country by country.

Some researchers hypothesize that high numbers of missing women result from the "epidemiological transition" – differing disease compositions between developing and developed countries. This theory suggests that women in developing countries initially suffer from more infectious diseases, such as malaria, tuberculosis and HIV/AIDS; as countries develop, women suffer from more chronic and degenerative ailments, such as cancer.

But Dr. Anderson's results reject this hypothesis. When she compared the death rates of men and women by age, and further by age and disease, she found that there are missing women within each category. This indicates that despite a changing disease composition, there is still excess female mortality in all diseases – epidemiological transition cannot explain the phenomenon of missing women. Instead, Dr. Anderson believes that an overwhelming proportion of all female deaths are the result of inequality.



> “OUR ESTIMATES SUGGEST THAT EXCESS FEMALE MORTALITY IS A MUCH MORE UNIVERSAL PHENOMENON THAN PREVIOUSLY THOUGHT.”

Dr. Siwan Anderson

Dr. Anderson's data show that vast numbers of women in India die from preventable diseases and from poor medical care during childbirth. Others are victims of "injuries," such as fires, which are really deliberate acts of violence against women. Many of these are likely dowry deaths, where young brides are killed if their fathers do not pay sufficient money to the men they have married.

Discrimination is about more than access to medical care and violence against women. In China, a woman kills herself every four minutes. According to the World Health Organization, China is the only country where women are more likely to commit suicide than men; this number is particularly high in rural areas, where many women poison themselves with pesticides.

Some causes of female death may have elements of discrimination, but other factors also play a role. The incidence of cardiovascular disease among Indian women is disproportionately high; women die of this disease at a rate comparable to Indian men. This is in contrast to developed countries such as Canada, where men are much more likely to die of cardiovascular disease. (There is also a relatively high incidence of cardiovascular and respiratory disease among Chinese women.)

All of Dr. Anderson's new data and analysis raise pressing questions about the underlying causes of disproportionately high numbers of female deaths. Does rapid economic development go hand in hand with increased female mortality? In China, is the low socioeconomic status of rural women driving such high suicide rates? In India, how do the caste and dowry systems play a role in the high numbers of injuries? Are Indian women getting similar care for cardiovascular disease as men?

These questions will be explored in the next stage of Dr. Anderson's research – mapping out missing women and their causes of death state-by-state within each country. Such analysis will help to define discrimination more precisely, and disentangle the complex influences of economic, social, and cultural factors on the numbers of missing women.

The situation in sub-Saharan Africa raises another unique set of questions. Dr. Anderson revised the estimates of the number of missing women in that region – her results don't match previous assumptions.

An unusual birth ratio hid the size of the problem. Everywhere in the world, boys outnumber girls at birth. In sub-Saharan Africa, however, while girls are still the minority, the ratio is higher there than anywhere else in the world. Earlier analysis did not fully take this into account, which disguised the scale of the problem of sub-Saharan missing women. Because there were more girls to start out with, it turns out that there are more missing women than previously thought.

When she took the unusual birth ratios into account, Dr. Anderson discovered that the number of missing women in sub-Saharan Africa had long been underestimated. Her numbers show that the proportion of missing women is actually larger than in either India or China.

"DISCRIMINATION IS ABOUT MORE THAN ACCESS TO MEDICAL CARE AND VIOLENCE AGAINST WOMEN. IN CHINA, A WOMAN KILLS HERSELF EVERY FOUR MINUTES."

Sub-Saharan Africa is the only place in the world where women are more likely than men to die of HIV/AIDS. In this region, it accounts for over a third of excess female deaths. The World Health Organization emphasizes that social power and violence play a key role in the transmission of HIV/AIDS. Women are often forced to have sex and find themselves in situations where they are unable to negotiate for safer sex practices. What's more, women are more susceptible than men to infection from HIV in a heterosexual encounter. It is not yet known which factor plays the larger role in the incredible number of women dying of HIV/AIDS: the mode of transmission, degree of coercion or differential medical treatment.

Malaria is another common cause of female death in sub-Saharan Africa. The reasons for the skew are not yet known, but Dr. Anderson suspects that unequal access to preventive measures may be to blame. She is investigating questions such as: Do men have better access to mosquito nets than women? Who is taken to the hospital? Is there some genetic link that gives women a disadvantage in fighting malaria?

"This work on missing women is of the utmost importance for developing countries," says Elhanan Helpman, director of CIFAR's *Institutions, Organizations and Growth* program. "Discovering the reasons behind this gender bias will provide important insights into social norms and values that impact societies in these countries way beyond gender inequality."
To further develop their understanding of excess female mortality, Dr. Anderson and her colleague looked to historical data for now-developed countries.

At the start of the 20th century in the United States, a comparable proportion of women was missing. Dr. Anderson is now trying to analyze to what extent discrimination played a role then as well. She is also investigating at what age and for what reason these women disappeared. Evidence gathered thus far indicates that the historical cases in developed countries are just as complex as current situations.

Dr. Anderson's research takes our knowledge beyond the common explanations of gender bias at birth and the "epidemiological transition."

"Original estimates of women missing from discriminatory parental preferences need to be seriously revised downwards," says Dr. Anderson. "Our research takes a preliminary step towards a unified study of a much broader set of issues."

By disentangling the true scale and nature of the issues behind the phenomenon of missing women, Dr. Anderson has demonstrated that, while some aspects of the problem are universal, each region's story is different. By providing clear answers and new understanding of this complex story, she is helping to inform the work of international development agencies and human rights organizations. Her research is a valuable tool, not just for those who wish to understand the problem, but ultimately for those who will change it. ▪

TO COMMENT ON THIS ARTICLE, PLEASE VISIT
cifar.ca/missingwomen

DONORS HAVE MANY REASONS FOR SUPPORTING CIFAR

By Adam Stewart

CIFAR's more than 350 researchers make discoveries in fields as diverse as economics, genetics, psychology, physics, and others, but there is one element common to all of them: the support of our visionary donors who look beyond the everyday world to imagine how advanced research can answer some of the most fundamental questions of our time.

We asked some of our donors to share with us their reasons for donating to the Institute and the value they see it having for Canada.

David and Sheryl Kerr are long-standing supporters of CIFAR and David is a member of its Council of Advisors. They regularly attend the Institute's events to challenge their understanding of the world around them.

"The sheer excitement of speaking with new and fascinating people is what brings us to CIFAR events. It's quite common for us to go from a conversation about the outer reaches of the universe to a discussion about microbes in the ocean and a debate about climate change," David said.

"We feel privileged to be able to attend CIFAR's events and hear from some of the leading experts in the world about topics we don't often think about in our daily lives. It is always interesting to share what we've learned with our friends."

Collaboration and the sharing of ideas is the foundation on which CIFAR's 12 multidisciplinary programs are built. It is also one of the reasons Bill and Janet Young support the Institute through the Bealight Foundation.

"We appreciate CIFAR's focus on bringing top researchers from different fields together to share their unique perspectives," Bill said. "Scholars will not answer the biggest questions of our time alone. Instead, collective genius will push the boundaries of what we know and carry us forward to a new era of discovery."

One of the most fundamental reasons people support CIFAR is the inherent value it adds to Canada.

"CIFAR's contribution to Canada's knowledge economy cannot be overstated," said Heather Bala-Edwards, who supports CIFAR with her husband Murray. "The future of Canada will be based on intellectual excellence, and CIFAR is leading the way by recruiting some of the brightest minds to Canada and retaining them here."

Our donors realize that to truly make a difference, you must be willing to invest in research projects early on and sustain funding for the long term. Charles Hantho and his wife Eileen Mercier are two of CIFAR's far-sighted donors who attest to this.

"For us, it's about supporting researchers' groundbreaking ideas from the moment they begin to take shape," Chuck said. "While there is tremendous value to applied research projects – curing diseases or building more efficient microprocessors, for example – we must not overlook the fundamental research that makes innovation possible. CIFAR is one of the principal ways Canada contributes to international basic research."

Though each donor's reason for supporting CIFAR is different, the common thread is their belief in the power of advanced research and their willingness to help fund those researchers who are not afraid to tackle the biggest questions of our time.

We invite you join the Canadian Institute for Advanced Research's donors by making a tax-deductible donation at www.cifar.ca or mailing us at 1400-180 Dundas St. W., Toronto, ON, M5G 1Z8.

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Send us a message at donate@cifar.ca and tell us your story.

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