

**RATS, A RUSSIAN SOLDIER AND A RARE DETERMINATION TO SUCCEED GAVE BARBARA ARROWSMITH-YOUNG ALL THE ELEMENTS SHE NEEDED TO CHANGE HER LIFE - AND ALONG THE WAY HELP THOUSANDS OF OTHERS OVERCOME DEBILITATING LEARNING DIFFICULTIES. BY JANET HAWLEY.**

**I**F IT WASN'T FOR A STOIC RUSSIAN SOLDIER LIVING WITH A BULLET lodged in his brain, and then a cage of playful rats, Barbara Arrowsmith-Young would not have become the woman who changed her own brain. Nor would she have helped almost 4000 learning-disabled children and young adults who traverse the globe to take her program change their brains, too.

At the Toronto headquarters of her unique Canadian and American schools – think brain gymnasiums – Arrowsmith-Young reflects with a wry smile that fate and serendipity can entwine in the weirdest ways to nudge scientific breakthroughs.

Dr Norman Doidge, the noted Canadian psychiatrist, researcher and author of the best-selling *The Brain That Changes Itself*, calls Arrowsmith-Young's personal journey "truly heroic" and puts her work "on a par with the achievements of Helen Keller". In a foreword to Arrowsmith-Young's autobiography, *The Woman Who Changed Her Brain*, to be published by HarperCollins in May, Doidge calls her "a pioneer; a bold and ingenious woman, deeply empathic and utterly determined. Rarely is the person who makes the discovery the one with the defect. Barbara is an exception."

Arrowsmith-Young is an intense, elegant woman of 60 who talks and moves gracefully, radiating warmth and good humour. It's a world away from the frighteningly confused, inwardly tormented loner she was, often sinking towards suicide, until age 26.

She was born with an asymmetrical brain, half her faculties brilliant, half severely disabled, but her near-genius half was unable to control her other half, which was a stumbling, mumbling, unfocused dolt. "I grew up regarded as a version of an idiot savant," she says. "I could parrot the 6pm news verbatim at 11pm, but not understand what a word of it meant. Teachers told my parents I had a mental block, so I literally thought I had a wooden block in my brain."

At 26, Arrowsmith-Young read a diary written by an intelligent Russian soldier, shot in the brain in 1943, in which he meticulously recorded his subsequent disabilities. "It was like meeting my twin soul," she remarks. "The identical damage that a bullet had done to Lieutenant Lyova Zazetsky at age 23, I was given at birth."

The next year, she learnt of a scientific experiment at the University of California, Berkeley. "A cage of rats given an enriched environment, with running wheels and a playground of toys, grew larger brains than rats kept in a sterile cage. It was my eureka moment. I decided if rats could grow their brain capacity bigger and smarter, so could I," she says with a defiant grin.

"I imagined my own impaired brain as a muscle, and invented stimulating exercises to target weak areas that didn't work correctly. I repeated exercises over and over, 12 to 14 hours daily, increasing the degree of difficulty and complexity month after month. Yes, it was obsessive."

After more than six months, dormant parts of her brain began stirring awake. Suddenly she could function like a normal person. "It felt like finally stepping out of a terrible fog into total clarity," she says.

Without realising it, Arrowsmith-Young was utilising the principles of neuroplasticity, at the same time that scientists were only beginning experiments in this field. Previously, science had contended that the brain is hardwired at birth. This view of the unchangeable brain has since been overturned by numerous clinical trials that show mental exercise and mental experience can alter its structure.

PHOTOGRAPH BY  
**PIERRE GAUTREAU**

**Brain trainer:** Barbara Arrowsmith-Young (opposite), a teacher and pioneer in the field of education, was born with half her faculties brilliant, half severely disabled.

Today, a steady stream of apparently bright kids, who also suffer severe learning difficulties, attend the 34 schools in Canada and the US offering the Arrowsmith program.

**TEAM AUSTRALIA**

NINE AUSTRALIAN CHILDREN ARE AMONG SEVERAL international students attending the Eaton Arrowsmith school in Vancouver. Their families call themselves Team Australia.

The mother of a 17-year-old girl, who recently returned to her Sydney private school, emailed me a two-page list of expert therapies and coaching that her daughter had undertaken for 10 years, adding, "It all paled into insignificance compared with what Arrowsmith achieved in five months." Her daughter, who last year could barely achieve 50 per cent in her exams, "just achieved 95 per cent in advanced English and 80 per cent in chemistry in her first two HSC assessments".

Arrowsmith-Young cautions: "We can't help everyone; our program can't help intellectually disabled or autistic children. In some students the turnaround is dramatic, within a year, but most require three to four years."

Typically, the children who can be helped are of average or above-average intelligence, but also have various puzzling blocks that leave them unable to grasp how to read or write fluently, or do maths, or focus on tasks, or recall instructions. They also can't see relationships between facts, reason logically or understand abstract concepts. (Ten per cent of students are said to fit somewhere in this category.)

Typically, too, parents have spent fortunes exhausting every avenue of help – medical and psychological checks; dietary tests; speech, ear, eye therapists; special instruction and tutors – but the children fall further behind.

Numerous Arrowsmith parents I spoke to described family heartache watching once-happy kids develop low self-esteem, anxiety and behavioural problems as they slid behind their peer group. Tantrums, explosions at homework time and deep despair were common, triggered by frustration with their own cognitive inabilities. No matter how hard they tried, they just couldn't "get it". Often the children had been wrongly diagnosed with attention deficit hyperactivity disorder and prescribed medication.

Lisa Karoly, a Toronto personal-injuries lawyer, said her son Zac, at six, was "a mess of a human being. He was totally not getting anything at school or in life and was so angry as a result. He couldn't express himself properly, couldn't learn to read or write, his body movements were unco-ordinated, he never smiled. Everything was so confusing and scary to him; he acted up and was thrown out of class every day. Family life became so difficult. But after three years at Arrowsmith, everything in his brain has clicked into place. He now gets everything, he smiles, and is ready for normal school."

Arrowsmith-Young explains the fundamental difference in her approach: "The traditional way to help children with learning disabilities is to avoid the areas of weakness and work around them; provide compensations like extra time in exams, a scribe or reader or technological assistance, or simplify their curriculum. These compensations and coping techniques often continue right through school, like crutches.

"The Arrowsmith way is to target the weak areas of the brain and strengthen them. We do not teach content, but instead change the brain so it can absorb, retain and process content. Different brain exercises strengthen different



**HOW TO REWIRE A BRAIN**

“ I imagined my own impaired brain as a muscle, and invented stimulating exercises to target weak areas that didn't work correctly. ”

cognitive functions – visual and auditory memory, reasoning, planning, problem solving. Once the brain is woken up, it doesn't revert – it stays in its new, changed form."

New students may arrive laden with emotional baggage. They are used to failing and feeling that they're dumb. Motivation soon increases as students master each step, ritually receive a class clap and do a happy dance to celebrate, then move on to the next level of difficulty.

To an outsider the exercises seem slightly bizarre. I watched students in the Toronto school intently clicking away at computer screens with 10-handed clocks. Others are memorising a sequence of shapes, then spotting those shapes amid a maze of figures on the next screen. In the next classroom, students sit like pirates with a patch over one eye, tracing Hindu script, thus forcing the weaker side of the brain to work. It makes sense when you think of it as physiotherapy or a Pilates workout for the brain, strengthening weak areas through repetitive exercise, massaging stiff lesions and increasing flexibility so messages can travel through.

## SUICIDAL THOUGHTS

BARBARA ARROWSMITH-YOUNG WAS BORN IN Peterborough, Ontario, to a high-achieving family. Her father, Jack Young, was an engineer and inventor with Canadian General Electric and held 34 patents on ways to move electricity through huge machines. Her mother, Mary, was a teacher and nutritionist. "No one knows why I was born with a damaged brain," she says. "Perhaps I suffered a stroke at birth, as I had no awareness or control of the left side of my body."

As a child, she was a bewildering mix of extreme capabilities and extreme incapacities. "I had a phenomenal memory, I could recite entire movie scripts or lists of facts like a machine, but I had no ability to use the information, to process it into reasoning or logic. I couldn't understand cause and effect, or see connections. I couldn't fathom the relationship between the two hands of a clock to tell the time. I had no concept of humour, irony, metaphor, sarcasm, conning or deceit, so I was unable to understand normal social relationships. I'd replay conversations over and over, trying to grasp what was meant."

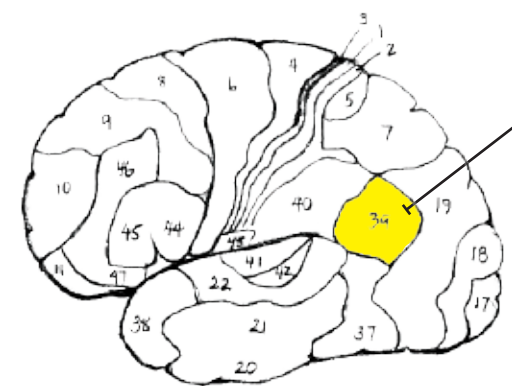
Eventually she learnt to read and write, despite her brain making her see and write some letters and numbers backwards. As well as having no control over her left arm or leg, she had no perception of space or distance, and so was always bumping into things and getting lost. "My saving grace was a strong frontal lobe which gave me a steely determination. I also had good intuition," she remarks cheerfully.

Desperately wanting to please her parents and be a success, Barbara forced herself to memorise schoolwork, going over it multiple times, trying to glean some meaning. "It was like trying to catch a beam of light," she says. "If an exam was fact-based I'd get 100 per cent but, if it required reasoning, I'd fail miserably. Teachers couldn't understand how I could be so bright yet so stupid. There was no diagnosis of learning disabilities back then."

She had few friends and her self-esteem plummeted. "My beloved cat, Star, was my best friend. I'd pour out my misery to him."

Moving into senior school, her multiple learning disabilities became more obvious. "Studying was like swimming through quicksand. I'd go down to the basement and pound my head against the dryer." She oscillated from anguish and suicidal thoughts to obsessive determination.

Scraping into the University of Guelph in



Ontario, she began a bachelor of applied science in child studies, hoping to better understand her own condition. Serendipity finally arrived. A handsome PhD student named Joshua Cohen gave her a book written by the admired Russian neuropsychologist Aleksandr Luria, *The Man with a Shattered World: The History of a Brain Wound*. Luria had remained close to the shot soldier for 30 years, and the book included the soldier's diary. Luria also did an enormous amount of research on brains (he had many wounded Russian soldiers to work on) and intricately mapped the regions responsible for various functions.

The more Arrowsmith-Young read, the more her intuitive light bulbs flashed, and the twin mystery of her own brain malfunction and the soldier's began to unravel. "The bullet had lodged in his left occipital-temporal-parietal region, a junction that integrates signals from the [three] lobes responsible for vision, sound, language and touch. The damage blocked his brain from analysing or synthesising the information input and making use of it. Now I knew what part of my brain was blocked."

Then she read about the caged rats exercising their way to bigger brains. She devised her first cognitive exercise to kick free the block. Never able

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**Mind field:** (left) the Brodmann areas of the brain, showing section 39, the part of the brain damaged when Russian soldier Lyova Zazetsky (above, at left, with the man who studied him, Russian neuropsychologist Aleksandr Luria) was hit by a bullet; (below left) Barbara Arrowsmith-Young with students at her school. The eye patches force weaker areas of the brain to work harder.

to tell the time, she created hundreds of flashcards with clock hands, and for 12 hours a day compelled herself to recognise the relationship between the two hands. "As I got better at it, I made the flashcards more complex, adding more hands, to tell seconds, days of the week, month, millennium, and forced myself to do it with speed and accuracy." Six months of clock flashcards "finally activated the moribund part of my brain, getting the neurons to fire in order to forge new neural pathways".

She devised further exercises to regenerate other parts of her brain and fairly soon, she says, all her functions unfogged and became normal. With her new clarity, she completed a master's degree in psychology at the University of Toronto, and ploughed into understanding brain function. She also married Cohen and in 1978 they began teaching the program before, in 1980, setting up their first school in Toronto with eight students. They named it Arrowsmith after the pioneering spirit of her paternal grandmother, Louie May Arrowsmith.

The school expanded in Canada and a branch opened in the United States, in New York, in 2005. She continued to refine her methods of diagnosis, citing 19 areas of the brain most commonly responsible for learning disabilities and inventing neurological calisthenics to correct them. "Perhaps I inherited my father's skills as an inventor," she says.

## LEAP OF FAITH

IN 1994, THE MARRIAGE AND BUSINESS PARTNERSHIP with Cohen ended (the couple were childless; Barbara suffered from endometriosis and had four miscarriages), but Arrowsmith-Young soldiered on solo with her pioneering schools. In 2001 she met Doidge, who became impressed with her cognitive exercises and the enhanced outcomes of her students. Doidge has since called Arrowsmith-Young "an outstanding member of the first generation of neuroplasticians".

Doidge forecasts great advances lie ahead, with neuroplasticity being used to enhance brain function and the recovery of brain function, and in areas including education, stroke recovery, pain management and age-related cognitive decline (which is different to dementia, he stresses).

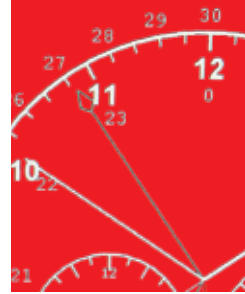
Arrowsmith-Young is so committed to her students and protective of the program's integrity that strict protocols apply when setting up new centres. "The program simply won't work unless it's delivered properly," she says.

Teachers attend a three-week Arrowsmith training course and schools pay a licence fee of \$4500 a year per student for a personalised program for each student. The aim is for students to conquer weaknesses rather than just cope with them.

As with all paradigm shifts, education authorities have been cautiously slow in more widely adopting Arrowsmith techniques, which would mean a radical change in entrenched teaching methods for learning-disabled students. The Catholic Education Office in Sydney and two Queensland bodies are seriously exploring introducing the program. The most common concern is that students, already struggling with the academic curriculum, will fall further behind if withdrawn for half or a full day to attend Arrowsmith.

It requires a big leap of faith to commit to a short-term strategy, hoping for long-term gain.

Arrowsmith-Young suggests that, on resuming normal school, students have a tutor for the first year to help them catch up on normal curriculum subjects. Most catch up quickly with their new, improved cognitive abilities.



However, several parents, including some from Team Australia, recall being harangued for their carefully evaluated decision to send children to Arrowsmith. Deborah Thompson, a Toronto financial analyst who sent her son, Sam, to Arrowsmith, said, "People told my husband and me we were destroying Sam's life, that we might as well be throwing chicken bones on the floor and doing voodoo. But Sam was seven and reading for him was torture. He had significant communication problems; he couldn't get his words out. We knew there were pathways in his brain, but the metaphor I use is that it took Arrowsmith to sweep the snow off the pathways." Sam returned to regular school after three years at Arrowsmith. Now 19, he is a voracious reader and lucid talker and is studying business administration at university.

Suzie, a lanky 18-year-old who excels at sport, tells me she didn't want to go to Arrowsmith two years ago. "I had attention deficit disorder and no memory for schoolwork," she says. "I'd put information into my brain but could never retrieve it. I was planning on becoming a dog groomer, which was my highest aspiration for myself. To please my parents, I threw myself into the Arrowsmith program so I could get through it in a year and leave. But I was astounded at the way it transformed me." Now back in regular school, she's achieving marks of 85 to 90 per cent and plans to study chemical engineering.

Sarah, 25, says, "All my life I've been so frustrated. I knew I had tools in my head, but I couldn't use them. My family, teachers, always told me I was lazy. I wasn't lazy. I just could not fit things into place. Now I can. Arrowsmith is hard work, but so worth it. It's astonishing to go home each day, realising you can now think about something, figure things out, in a way you never could before."

Lisa, 19, the shy, pretty daughter of two high school teachers, had been taught piano for eight years. "I could only play by memory, I could never understand how to sight-read the notes on sheet music, I couldn't attach meaning to the symbols," she says. "Arrowsmith didn't teach me music, but after a year of cognitive exercises, I can now connect information inside my brain, so I sight-read music perfectly. I now *get* how to do maths."

Devorah Garland, a tall, blonde, confident and good-humoured Canadian journalist, was a member of that small first class in the inaugural 1978 Arrowsmith program. "I owe my life to Barbara," she declares. "When I finished high school I was an educational failure, with such low self-regard I could only think of using my looks to become a prostitute or marry a sugar daddy."

A counsellor suggested she enrol in the program. "Barbara immediately understood me; my learning disabilities were somewhat similar to hers – I couldn't process information, I had no idea what humour was, my vision was two-dimensional, so the world looked like cardboard cutouts. Within a year, Barbara fixed my brain. I could reason and see in perspective. I'd walk down streets staring at buildings in amazement. I began to get humour – hey, I could actually tell a joke!" She set a new career course, studying journalism.

"I'D LOVE TO SEE REFINED FORMS OF THE ARROWSMITH PROGRAM AVAILABLE to everyone," says Arrowsmith-Young. "I think it would be extremely useful if all school children, in grade one, were taught cognitive exercises – to get their brains stimulated and ready to learn. Then there would be no stigma, because everyone would do it. Children with learning disabilities could be identified early, helped early, and others would have their brains tuned up.

"I'd also love to see different forms of cognitive exercises, using the principles of neuroplasticity, broadly available to everyone, online. Maybe we could have mental gyms where you drop in to do regular exercises to keep your brain sharp. But it needs a Bill Gates-type philanthropist to come along and fund the research and software to do this, plus it requires a pool of teachers to monitor it and provide user feedback."

Doidge considers learning disorders to be one of the most underestimated underlying causes of failure and behavioural problems at school and in life. "It wrenches my heart to think of all the children, sitting in schools throughout the world, wiring into their brains each day the idea that they are dumb or useless or losers, because many educators are still under the sway of the doctrine of the unchanging brain."

I put it to Arrowsmith-Young that her life sounds a bit like Sleeping Beauty waking up after being kissed by the Prince.

"Yes," she replies with a soft laugh, "but I was my own prince." GW

Barbara Arrowsmith-Young will appear at the Sydney Writers' Festival in May. Janet Hawley travelled to Toronto with assistance from HarperCollins.



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