

and Anne Siegel



writes and illustrates comics with a feminist angle.

Kindness and sisterhood are her watchwords. She gave up science after school, so this project for the CNRS was an opportunity to rediscover a fascinating field. Passion is contagious!

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Ali Charara, Foreword

In today's constantly changing society, the rise of computational science as a field of scholarship demonstrates the importance of research in understanding tomorrow's world. The French National Centre for Scientific Research (*Centre national de la recherche scientifique*, or CNRS for short) has made these research topics central to its strategy, building connections with each of the other branches of science.

Computational science is much more than just coding and Al. It covers a wide range of areas, incorporating human-machine interfaces, robotics, algorithmics, green computing, automation, bioinformatics, data science, the web, image and sound analysis, cybersecurity, and quantum information – and the list goes on. This research is absolutely crucial in understanding the major issues facing society today, including the environment, climate change, the energy transition, health, biology, tomorrow's towns and regions, and personal data protection. These are all fields to be explored, many of which have developed in the last few years.

At the CNRS and our partner institutions (including universities, engineering schools and research centers), research staff, including both the scientific and administrative teams are committed to pushing back the boundaries of computational science. Women are currently significantly underrepresented in this field, and that's a problem. The CNRS has made its gender equality strategy one of its top priorities going forward, particularly in terms of hiring and career development.

Léa Castor's lively portraits of twelve women now working in computational science showcase the vibrancy and diversity of research in the field, aiming to demolish some of the stereotypes that turn young women away from an enriching career path. The twelve women in this book have much in common – enthusiasm, a can-do attitude, a sense of humor to tackle the challenges they face, and the urge to make a difference. As we worked on the book, above and beyond their similarities, we were also struck by the diversity and range of their paths into science and what drove them to take up a career in research. Computational science welcomes all talent with open arms, regardless of gender!

This book addresses young people in a playful way, combining art and science, with the aim of showing readers that working in the scientific field is not as inaccessible as it seems. We hope these portraits will inspire all our readers, whatever their gender, to consider a career in the fascinating field of computational science. A world of discoveries awaits!

Ali Charara, director of the CNRS Institute for Information Sciences

Anne-Cécile Orgerie : greener computing

Of course, everyone told Jack (the boy version of me) that one day he would be an \$ ENGINEER* (#everydaysexism, right?)

When I was a bit older I loved programming games on my calculator. I didn't even know what I was doing was called CS-to me, it was just a bit of fun. Back then, CS wasn't really taught at school.

Many people have helped me in my career ... women in particular have been great at leaning on. not many of us girls around, so... WE'VE GOT EACH OTHER'S BACK! You might not think so, but research is a very interactive job with plenty of teamwork. Lots of people really enjoy it. Only problem is, it is still not very diverse... Too many people called Jack, not enough called Jane, Samia, Yael, Lindsay, Catline, and so on. why autourselves So my question is, off from 50% of human brain power!

Claire Mathiev, the love of algorithms

I'm Claire Mathieu, I'm 55, and I'm a CNRS senior researcher.

(and for those of you who don't know, like the author, algorithms are a set of instructions for volving a given problem.)

I fondly remember a little story from when I was four. I loved Petit Suisse yogurts.

NO YOGURTS!

Actual proof that I had no reason to be annoyed with mom.

That's how I learned that proof can be comforting.

PROOF IS A SOURCE OF STABILITY.

(I'm getting to algorithms, I promise!)

ALGORITHMS GIVE ME THE SAME SENSE of SATISFACTION.

Demonstrating a truth that people agree on.

But it book me a few more years to get to grips with them.

During Righ school, I wondered

So I right up for an intense math undergrad program and then wint to college.

I was endlessly fascinated by math, logic, and solving problems, even after class.

Back in the 1980s, the advice was to take computer science classes. That is where I first met algorithms and fell in love.

Fortunately, there are plenty of people in research who do believe women have got what it takes.

So I book the science route and I was right - I foved it! I took advanced classes and then studied engineering and I began to specialize in human related fields such as

I also chair the cybersecurity mational research duster.

I run the group and facilitate exchanges for all our members

Cybersecurity is a huge field. Our common goal is sharing our knowledge across our subfields to make systems as strong as possible. We can only do that by working together.

Even as a child, I lived and breathed science. We had loads of equipment at home for experiments, I loved playing around with it.

I decided to study at university. I didn't get onto the math MSc but I found out there was another course in math and computer science. So that loss turned into my gain!

I loved reading spy novels and foreign writing systems like hieroglyphs and Japanese kanji so cryptography and secret codes were perfect for me!

I had brilliant teachers, top experts in their field but all very open and dedicated to us students.

Elsa Cazelles, sorting sounds with sand

I applied for several post-docs abroad, didn't get of all them,

then took the one in Santiago, Chile. I was so pleased to join a small, friendly team and discover a new culture.

On break at a conference with my Chilean colleagues ?

Like when I was doing my PhD, I met people working on different areas of math. It was brilliant to chat at breaks, no stakes, just the delight of

INTELLECTUAL STIMULATION.

I interviewed for the CNRS on March 9, 2020. I'd come back to France with minimal baggage, just for two weeks...

And all my stuff was still in Santiago!

I got the position at CNRS. My field is OPTIMAL TRANSPORT for data analysis.

Now I can code a model on the computer that will automatically recognize the frequencies in an audio estract and put the right label on it. # dog_barking My companison tool can # hern honking automatically classify 100,000 sounds - no need to listen to them! # car_ novving # Grees_ This sort of sound recognition Duraying is used by streaming apps to suggest music, labeled rap, rock, or whatever you like. That's just one example! I usually work on three or four projects at a time. There is much halk these days of quotas and positive discrimination in research. Did I get the job because I was the right fit, or because I'm a woman? Anyways, I've always felt right at home in my team. I'm delighted to be flying the flag for diversity!

Being a woman has definitely shaped my career. I book the standard path and followed the examples of men I knew because it's reassuring to work towards a world you're familiar with.

Sarah Ghen-Boulakia, the biological data detective

At school, I didn't really fit the mold. I got really good marks in philosophy and math but I hated learning stuff by heart. None of that nonsense at college! You have to be curious, creative, and selfmotivated. I loved finding connections and figuring stuff out. The perfect match!

The theories now being developed will soon be in use in quantum computing and a host of other areas, such as AI, medecine, and so on.

Even as a lowly PhO student I worked with the team of a Nobel Prize-winning physicist.

I've often been the only woman in class and at work, and that's not always been easy. But I honestly believe that

I was there from 1985 to 1990. Back then computers were super expensive so no-one had one at home.

one person can write from ten to fifty lines of code a day!

I worked in a private company so I thought I wouldn't be a good fit for public-sector research. I sat the CNRS exam in 2004 to become a research engineer, and despite being shy and having an impostor syndrom... I made it! I was so pleased and proud!

The World Health Organization (WHO) sent medical doctors files full of raw data from clinical trials.

Marie-Christine Rousset and the world of Web 3.0 Hi Kere! I'm Marie - Christine Rousset, I'm 62, and I'm a professor at the Universite Grenoble Alpes. My main research interest is REPRESENTING KNOWLEDGE such that it can be understood by Rumans and automated by machines. I build bridges between humans and machines! To give you a concrete example, take DBpedia, the semantic version of Wikipedia. the meaning of words, independently of their syntax (the author looked it up to save you the effort) So if you ask What scientists born in Europe have won a Nobel prize? Wikipedia At the moment you have to go through the list of Nobel Prize winners by hand, pick out the scientists and then check Irène Joliot-Curie their place of birth by clicking on their individual pages. long and boing!

But if you start from the data available in DB redia,

But the magic only works if you draw up a set of rules for the computer to understand the user request.

The examples may sound obvious to us, but they aren't to machines. My job is to create AI algorithms that can apply the rules automatically and explain the results.

It's always satisfying when a group project comes together.

I think my love of teaching also comes from my background. My parents were farmers, I was sent to boarding school at eleven and I had scholarships throughout my school career.

Ine lune

Computer science wasn't on the curriculum when I was in high school in the 1970s, but our math teacher a woman - did show us algorithms in the shape of punched cards.

> I know, amaging ion tit?!

The math formula you just worked out can be punched out on cards like this to create instructions for a machine to read.

I then studied in college. Back then, affirmative action measures meant there were as many places for girls as for boys. I was surrounded by women who were

SUPER INSPIRING.

Pauline Maurice and helping hand robots

My aim is to combine human brainpower with robot physical strength. The interaction has to be as simple and seamless as possible.

I'm a perfectionist and I love diving deep into a topic.

So I did a PhD, and it was great because you can get on with your topic however you want and you choose your own methods.

My partner also works in research and we had a long distance relationship for several years.

Then we both did a post-doc in Boston, over in the States. After that I did another post-doc back in France, and I got a research position with the CNRS, back in the team I started out with!

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Thanks to its tradition of research excellence, the CNRS is perfectly placed to meet the major social challenges of the modern age. Part of its remit is scientific outreach. The CNRS has chosen to make women in science a key plank of its strategy going forward, bringing a diversity of views and experiences to cutting-edge scientific research.

This comic was devised by the CNRS Institute for Information Sciences (INS2I), which leads a national group of 43 research labs with its partner organizations, universities and engineering schools. The portraits were based on a series of interviews with women working in scientific research in various capacities. Each interviewee was asked to talk about four topics, covering their research, their career path, what triggered their interest in science, and the place of women in computational science. Léa Castor then illustrated the interviews, working closely with the women and the INS2I gender equality team to capture the personality of each participant and portray their research faithfully.

The comic is designed to accompany the high school computational science curriculum. A teacher's guide is available in French, connecting the portraits directly to the curriculum and developing broader concepts in computational science.

This work could be realized by the INS2I gender equality team with the help of

Teaching material for schools was developed in partnership with:

All material is freely available online at https://www.ins2i.cnrs.fr/en/codebreakhers-digital-world

The gender equality team

The INS2I-CNRS parity and equality team works to promote parity in research laboratories and to challenge clichés about computational science. We all use digital tools in our everyday life. But how much do you really know about the science – and the scientists – behind the scenes?

These portraits of twelve women working in computation science offer a rich introduction to the diversity of the field today and tomorrow. Their inspiring accounts of building a career in computer science are bursting with enthusiasm, energy, humor – and the urge to make a difference. Read their stories and be inspired in turn!

> What matters is not your gender, but understanding what you want to do in life!