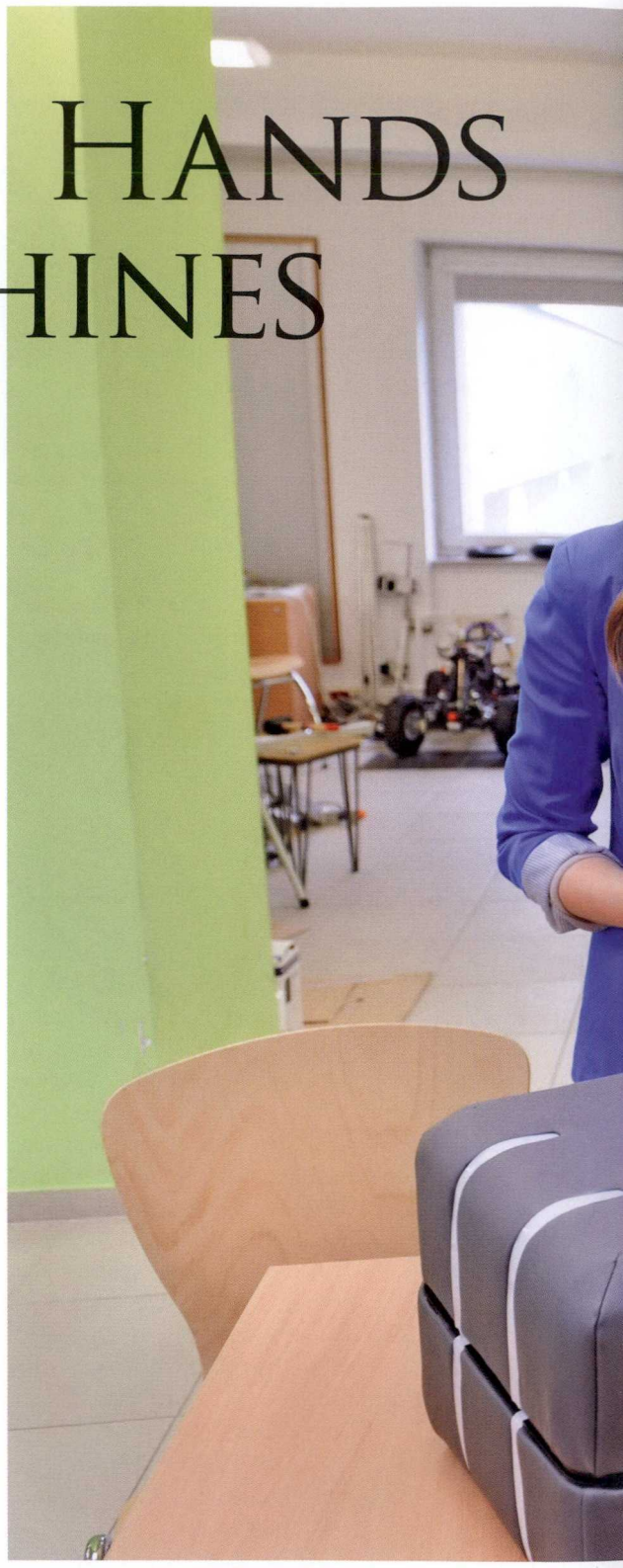
Helping Hands of Machines



We talk to **Igor Zubrycki**, doctoral student at the Faculty of Robotics at the Institute of Automation at the Łódź University of Technology and winner of this year's INTER competition of the Foundation for Polish Science, about robots supporting children on the autism spectrum disorder (ASD), artificial intelligence and dangers posed by machines.

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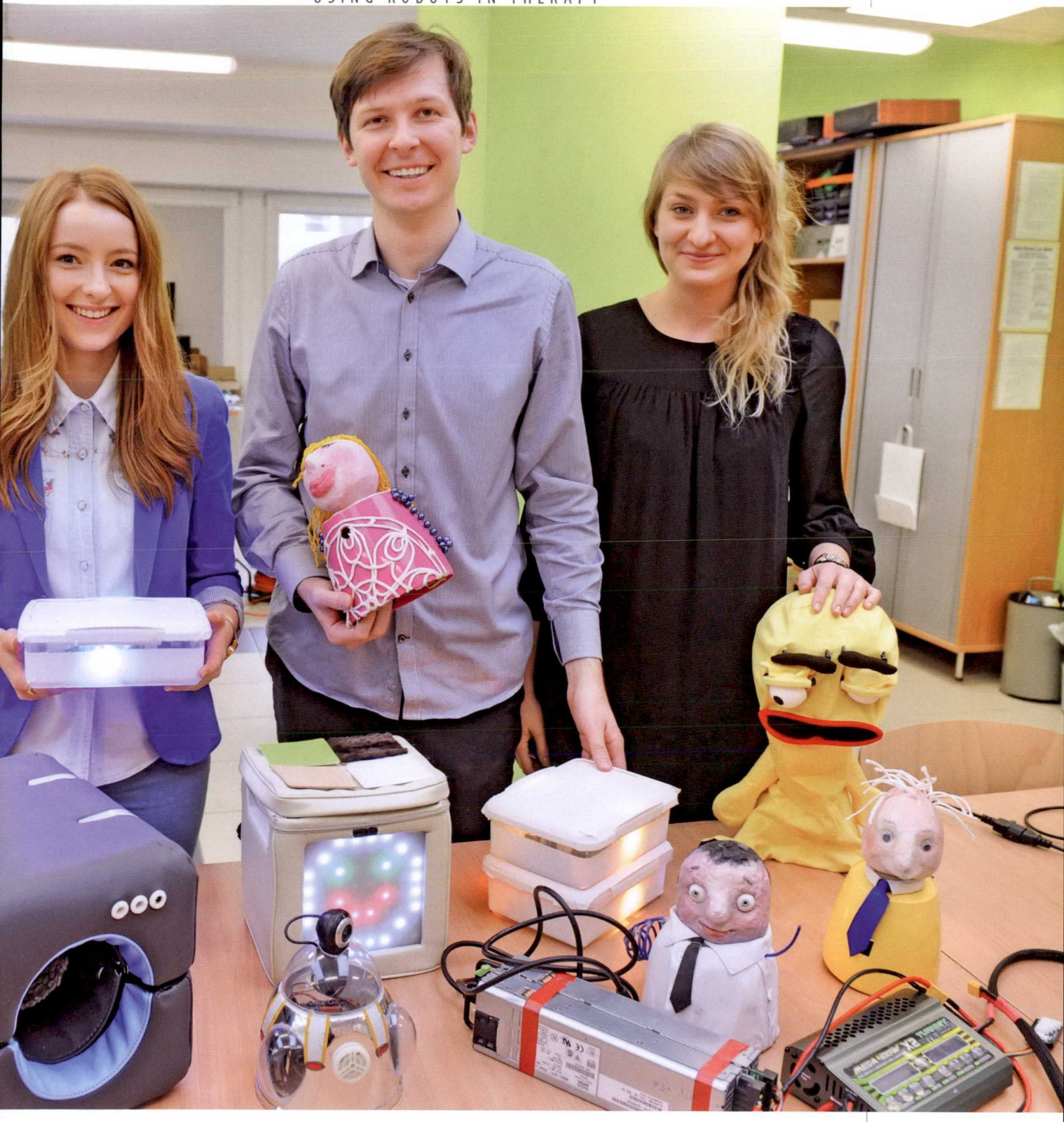
ACADEMIA: **Your team is involved with the program "Robotherapy, or robots as therapists." Was it always going to be a research project?**
IGOR ZUBRYCKI: No, we simply wanted to help children. We knew that robots have been used to support children on the autistic spectrum for many years. The literature even refers to the triad of therapist, child and robot. We can only start talking about delivering practical therapy once this triangle is complete, so we offered our support to the Navicula Autism Diagnostics and Therapy Centre in Łódź. This partnership gradually evolved into a more formal research collaboration. We noticed that certain problems remain unsolved, and this was very interesting to us.

Such as what?
To start with, we were working on typically technical issues, but we soon discovered that approaching them purely from the robotics perspective wasn't enough. After all, therapists of autistic children also need support. Autism therapists are very commonly affected by professional burnout, and finding ways of supporting them with robots or other technologies is a research field in itself.

What's the reason for their problems? Is it because their work is not always effective?
That's partly it. Therapists regularly spend up to four hours alone with their patient, who may not be responsive, which affects them mentally. There are also routine administrative tasks, which are monotonous and time-consuming. In short: red tape. Therapists have to fill out endless forms while looking after



their patients; it's not only laborious, but it can cause problems because they are distracted. We decided to make a robot converting speech into writing, so therapists can dictate their forms. We are also working on a machine intelligence which would recognize certain behaviors. All children are different, so the technology must be flexible. Let's say the child's behavior is undesirable or inappropriate. The robot registers it and prepares a report, taking pressure off the therapist who can concentrate on looking after the child rather than paperwork.

The majority of your work has been on robots assisting children.

Yes, this part of the project is developing really well. It involves working on issues of ergonomics, safety

and self-help. One of the main problems with autism is that we don't really know what causes it, so we can't "cure" it. What we can do is teach children certain skills which will help them manage better in their everyday lives. Robots are a kind of intermediary between our reality and autistic children's inner worlds, providing them with prompts and stimuli.

For example, children on the autistic spectrum are frequently hypo- or hypersensitive; some may be disturbed by sudden or louds sounds, while others don't respond to voices unless they are raised. Our sensory therapy robots generate certain sequences of impulses stimulating the patient's senses to accustom them to standard levels of stimulation. Robots must have an appealing appearance to encourage children to play with them, so we work with Dr. Anna Miarka from the Faculty of Design and Interior Architecture at the Academy of Fine Art in Łódź and her team.

You have also made moving dolls. What are they for?

It's really important that they look like simplified human figures, which is achieved by the Łódź-based artist Honorata Łukasik, who designs sculptures and puppets. I should explain here why the therapy is centered around robots. Children on the autistic spectrum tend to interact well with robots and are fascinated by them. The most significant issue they face is social activities such as interactions with other people, so using robots resembling humans can make the process easier. It can also solve another problem: people with autism frequently become very attached to just one person and don't want to work with anyone else. A robot can provide a useful alternative, and the patient may feel able to say things to the robot they wouldn't tell the therapist.

What distinguishes such toys from ordinary dolls?

Puppets need to be operated by puppeteers. Our robots speak and interact with their users, and they can be custom programmed, for example to provide a dialogue accompanying a certain scene. Of course it's impossible to predict the exact format in advance, but the therapist can adapt the program with a tablet or computer as they work with the patient.

Do the children influence the robot's behavior?

They do. They are interactive toys equipped with various sensors. When the child strokes a robot or says something to it, it can rapidly analyze the input and respond accordingly. Of course they also recognize each child – they know whether they're "talking to" Jack or Alice, for example.

Your team continues to work on such devices. How are you hoping to improve them?

We want them to be able to recognize emotions. On one hand, they could act as mirrors reflecting the therapist's feelings. If they become annoyed with the child for whatever reason, and the emotion is ignored, the situation can escalate. Children on the autistic spectrum are often very sensitive to emotion and may fly into a rage. There isn't much that can be done when the therapist is alone with their patient, so we want the robots to alert them to changes in their mood and behavior. On the other hand, the therapist may find it difficult to interpret the child's emotions. while the robot can achieve this by analyzing biological signals such as heartrate or sweating and alert the therapist accordingly. Perhaps they can release tension with a joke, and the therapy session can continue smoothly.

Are you not worried that such projects will raise fears that one day robots will replace people?

That therapists will be out of work and there will be less space for humans in the world? No. We want robots to be our helpers, our partners. We show that robots can play a positive role in developing relationships. It's like computers – people use them to make their work easier, but they can't actually do our work for us. Whichever way you look at it, the majority of technologies help us, although it's fair to say that certain ethical and moral questions exist.

So stories like Alex Proyas' 2004 film "I, Robot" in which a machine leads a rebellion of other machines against humans are just pop culture stirring up fears?

Definitely. As a robotics engineer striving to design intelligent robots, I can say that we are nowhere near

being technologically advanced enough for anything like that. Pop culture is populated by robots which express empathy or other emotions, perhaps frustration. It's not something we can achieve at the moment, and cognitive scientists working in robotics, such as Prof. Serge Thill from the University of Skövde, are extremely skeptical whether it will ever be possible. This is because emotions and intelligence in humans evolved to help us survive. Robots don't have a survival instinct; they don't mind whether they stop existing. We can program machines to be better at chess or recognizing Chinese symbols than humans, but they will also make many errors humans will not make. We can make robots with vast computing power, but does that make them intelligent or able to make decisions? No.

We want to create effective tools, but we must also make sure that people don't use those tools for destructive purposes.

But robots can learn.

That's true. For example, Watson is a supercomputer which is capable of analyzing extensive texts and drawing conclusions. It can answer fiendishly difficult questions – it even appeared on Jeopardy! where it beat extremely well prepared contestants. But its abilities are limited to acquiring information, known as machine learning. It also poses no threat to humankind and isn't plotting against us. Its system cannot accommodate this as a concept, because – as I said – it doesn't have an instinct to survive and reproduce. It simply doesn't care. The only potential threat, in my view, is using robotics technologies in weapon development, and I believe the majority of robotics engineers are against it.

Last year, the physicist and cosmologist Stephen Hawking, Apple co-founder Steve Wozniak and the philosopher Noam Chomsky published an open letter on this issue. They wrote, "Starting a military AI arms race is a bad idea, and should be prevented by a ban on offensive autonomous weapons beyond meaningful human control."

They also noted a fundamental barrier which they believe must not be broken: robots must never kill humans. This has led me to wonder whether robots really don't understand what humans instruct them to do, or whether they do show some kind of intelligence.

There is a robot on the border between North and South Korea programmed to shoot moving targets. It is the equivalent of a landmine and it uses camera images to recognize the human silhouette. But it doesn't need intelligence for that; it has been programmed by humans to perform certain tasks. So we really need to control the humans who do the programming, just as we control certain types of weapons – for example biological – because when bad people get their hands on such technologies, they can achieve terrible things. If we had killer robots, people would be able to use them to commit atrocities. Making killing devices is problematic in and of itself, but the weapons themselves don't make decisions. Drones and warplanes are controlled remotely by a single person or a team. They are not in the same place as the device, making it easier for them to pull the trigger. Automating the process of killing is key, but this is a moral problem for people, not machines. It is people who do the killing and we must not make it any easier.

Perhaps it should be a question of nomenclature, so instead of talking about artificial intelligence, we should refer to this property differently?

Perhaps, but it's also a question of human psychology. People are keen to anthropomorphize, as shown in the famous experiment by Heider and Simmel, in which people shown a short film featuring moving triangles imagine a human story and impose emotions on the shapes.

We project our needs and feelings on objects, especially those which are humanoid – if they look like us, we can believe them to have emotions and intelligence. Meanwhile everything that humans are capable of is an incredibly complex process with deep roots which can't be created artificially.

So we must take care what we do, and we should keep reminding ourselves of that.

Yes; we should remember that robots will always remain our tools regardless of how highly functioning they are, whether they are purely mechanical or whether they appear sociable. We want to create effective tools, but we must also make sure that people don't use those tools for destructive purposes. And, unfortunately as we all know it's incredibly difficult to stop people from doing things.

INTERVIEWED BY KATARZYNA CZARNECKA;
PHOTOS: JAKUB OSTAŁOWSKI

Pictured on the previous pages: (p. 21) Igor Zubrycki with Agnieszka Madej and Karolina Wilgocka, biomedical engineering students at the Łódź University of Technology, displaying a selection of sensory therapy robots: Sensable Sleeve (design: Kornelia Kulik, Dominika Rajska, Krzysztof Barzdo, Mieszko Polański, Mateusz Wodziński, Maciej Jarosiński, Łukasz Matusiak and Adrian Kowalik), Sensory Box (Szymon Surma, Magdalena Gregorczyk and Dariusz Urbański) and Blocks (Konrad Kustosik, Tomasz Wasilewski, Iza Mrozowska, Adrian Dutkowski, Michał Wyszyński and Piotr Belkner). The large yellow robot, Cesar Vandevelde's Ono, recognizes emotions and acts as the therapist's assistant. (p. 22) Interactive toy robots shaped like human figures (design: Honorata Łukasik)