



Materials researchers take the stage

Prachi Patel

Judging by face value, science and the performing arts might not have much in common. One is a hypothesis-driven effort to explain the world around us, often requiring a narrow lens and a dash of skepticism. The other, an exercise to unleash our imagination and create a new world. But in reality, science and theater share many traits: innovation, creativity, teamwork, and problem solving.

For over a decade, members of a theater group in the graduate school of Israel's Weizmann Institute of Science in Rehovot have been discovering that science and theater complement each other in unimaginable ways. Dabbling in theater, they say, has made them better scientists by freeing their minds.

"As scientists, our minds aren't very open," said Adi Salomon, a chemistry professor at Bar-Ilan University in Ramat-Gan, who joined the Weizmann theater group soon after she started her PhD program there in 2002. "If someone suggests a new idea, our instinct is to say 'No, it won't work.' The theater group teaches you to be more open to ideas. It frees your mind and takes it in a different direction; works a different part of your brain."

The Weizmann Institute theater group was born in 2002 when physics masters student Adi Natan initiated a drama class for his fellow graduate students. What started as a weekly class for a handful of students from the phys-

ics department quickly became a gathering of students and faculty members across disciplines.

These performing arts enthusiasts now meet for three hours in the evening in a lecture hall to examine different ways of conveying emotions, practice improvisation, develop character roles, perfect impersonations, and exercise their voice skills. Once a year, they put together a production at the 1000-capacity Tzavta theater in Tel Aviv. The troupe does it all: design and prepare the costumes and sets, control sound and lighting, advertise their play, and sell tickets. The productions have ranged from Shakespeare classics to more modern plays such as *One Flew Over the Cuckoo's Nest*. Plays by Israeli dramatist and author Hanoch Levin have become recent favorites.

For the typically serious, reserved academics, theater is a chance to loosen up, a respite from the nitty-gritty details and tediousness of research. But beyond being an engaged audience member, being an actor further jogs the brain. This leads to a clarity that can yield ideas, insights, and sometimes a breakthrough.

Salomon, who likens theater to meditation, recalls an insightful moment that occurred while she was working on a production of the Levin play *Walking in the Dark*. Her role involved repeating the same line eight times during the play, expressing it in a different way each time. "This twisted my mind and cleared my brain, allowing me to think in a new way," she said.

For the experimental chemist, the result was an idea for a theoretical research paper recently published in the journal *Physical Review Letters*. The article describes the interaction between the plasmons (collective oscillations of electrons) in an array of slits in a thin silver film and a layer of molecules deposited near the film's surface. Salomon had done experiments on this interaction as a postdoctoral researcher at Strasbourg, but had been unable to understand the physical origin behind her results. The idea dawned on her during one of her rehearsals.



Materials scientist Adi Salomon (center, with drum) says that getting funny roles came as a surprise, since they did not seem to fit her serious personality. But she excels at such roles and says they enable her to find new directions in her research.



Moti Fridman, an engineering physics professor at Bar-Ilan who is also active in the theater troupe, recalls working on an experiment involving 25 fiber lasers as a graduate student. He had to adjust each laser carefully, and it took him a full day to align three. That evening, at the theater group's warm-up session, which includes muscle relaxation through music and dance, an idea for aligning the lasers more efficiently came to him. He finished aligning all the mirrors the next day.

Another time, he was trying to understand a complicated theoretical article on extreme value statistics. "I was sitting in the theater doing improv when I finally understood it," he said. "Suddenly it all made sense."

Fridman's initiation to theater was tough. He suffered from stage fright when he first joined the group as a graduate student about seven years ago. But he knew that acting would help him overcome his fear of public speaking. "I knew I had to stand in front of audiences to present my research at conferences," he said. "My hope was to get that on-stage experience, but what I got was so much more."

As he matured on stage, research ideas started flowing more freely. He was also able to express those ideas to his peers more easily, which helped him fine-tune the ideas and turn them into research experiments. Most of the papers he published during his graduate studies were a result of ideas that came during theater rehearsals.

Both Salomon and Fridman said that exercising the artistic side of their brains helps them approach scientific problems with more creativity. Theater helps her think positively, Salomon said. And for Fridman, gaining a support group outside of the laboratory has been invaluable. "It gave me an anchor," he said. "If something was hard in the lab, I'd go to the theater group and know things would be OK."

An added bonus of the troupe is that it brings together creative minds from different disciplines, sometimes resulting in interesting collaborations. Case in point: a joint research project



In the play *Walking in the Dark*, Adi Salomon (right) had to say the same line eight times, putting a different meaning into it with each delivery.



Stage fright is a distant memory for materials scientist Moti Fridman (center), who says being an actor has liberated his scientific mind.

between Salomon and Fridman on the space and time manipulation of plasmons, for which they are co-advising a postdoctoral researcher. Both work in the field of plasmonics, which is the study of the interaction between light and the free electrons in metals; light can excite these electrons to collectively

oscillate as plasmons. Fridman studies the temporal side of plasmonics, while Salomon looks at its spatial side. The physicist and chemist wouldn't have met were it not for theater.

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