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AWARD WINNER PROFILE

Optical Evangelism

Gallieno Denardo fosters the spread of optics to the developing world.

BY RICH DONNELLY

Gallieno Denardo is an idea man. His enthusiasm for creative ways to advance education permeates his conversations. He has applied that excitement to developing the Winter Colleges and related programs in optics at the International Center for Theoretical Physics (ICTP) in Trieste, Italy, and this year he will receive the Educator Award from SPIE as a result of those efforts.



At the Winter College in 2004, (left to right) a chef, Gallieno Denardo, and ICTP/ICO award winners Revati N. Kulkarni and Imrana Ashraf Zahid look on as ICO President René Dändliker cuts the ICTP 40th anniversary cake.

The ICTP's activities in optics began in the 1970s when Alfred Kastler, 1966 Nobel Laureate in physics, a friend of ICTP director and founder Abdus Salam, first introduced a biennial optics college there. At the time there were no other optical offerings at the center. In 1985, Denardo became the organizer of the optics programs. Initially he increased the frequency to yearly, and soon began to expand the reach of optics at ICTP.

At first, Denardo says, "it was a fairly weak activity, because there was no follow-up. It wasn't connected to anything else." He organized satellite conferences and workshops on subjects like applications of lasers to the environment, and applications of optical fibers for communications. "Whenever we dealt with applied optics, if we included some demonstrations in the programs, there was an enormously high number of applications. People from developing countries were really very eager to see something concrete."

In 1989, Denardo set up a small educational laser and optical fibers laboratory with help and encouragement from Ali Javan, inventor of the helium-neon laser.

"This was probably the key to the success of the activities in optics," Denardo says. "I tried to link the theoretical aspect with the experimental, to also offer opportunities for the people who were coming over here to have some contact with lab activities—with applications, with instrumentation."



"I hope that at least a few places in the developing countries can become really important places in optics."

—Gallieno Denardo

Developing countries have benefited greatly from ICTP programs.

"Some good physicists from sub-Saharan African universities came over here, they went to the lab, they met scientists and researchers, and this slowly triggered some interest for optics in those universities," Denardo says. Eventually a network was formed called the LAMP (Laser Atomic and Molecular Physics) Network. "Of course it's a joke—a laser and a lamp are something different," Denardo says. "Now this network includes all the African physicists who work in optics. Actually, somebody claims that optics is the only part of physics which is really carried out in some countries in sub-Saharan Africa!"

The LAMP Network, affiliated with the International Commission for Optics, includes Dakar University (Senegal), Douala University (Cameroon), Cape Coast University (Ghana), and groups from most African countries. The ICTP facilitates many activities with these universities, both at their home campuses and in Trieste. A similar network called MON (Multipurpose Optical Network) exists in Latin America. The coordination of MON is based at Centro de Investigaciones Ópticas, La Plata, Argentina, and ICTP supports exchange visits of scientists among the members.

Denardo feels that the progress of optics in the developing world can be traced to one of optics' key qualities: visibility.

"Optics is so fascinating, so beautiful, that it can be a way to attract people to do physics in general," he says. "You can see the object of your study. In fact, many theoretical works can be immediately transferred to the laboratory, which doesn't happen in all branches of physics. In many cases local authorities want to see the application of what the physicists do in their own countries."

Denardo cites applications that have been put to immediate use in Africa—optical fiber in regions previously without communications infrastructure, and laser fluorescence of plants that can be used to detect disease in agricultural crops.

"This was developed in Dakar, and it's applicable to African plants," he explains. "Every plant has different molecular components, and therefore you need to adapt this system case by case. And in Dakar, this has been done for plants that are very widely used in agriculture. The system has been transferred to other countries like the Ivory Coast, where the minister of agriculture set up a laboratory based on this system."

The efforts of the ICTP have been helped greatly by the support of various international organizations, including SPIE, a cosponsor of the Winter College, he says. "I hope that at least a few places in the developing countries can become really important places in optics. And if this can be done, it will be thanks to the ICTP and the collaboration with SPIE and the other organizations."

Despite his success in expanding the reach of optics into the developing world, Denardo still has a goal he is keenly interested in reaching. "If there is one dream I have which is not realized yet, it is to have scientists come to Trieste, to work and supervise the students we have here, to tutor them, to suggest new problems, to take care of them—not for a few days but for a few weeks at least, on a permanent basis possibly. It may take a small amount of money. I am sorry to quote money, which is not beautiful, but we are not talking about big amounts. The problem is really to find the people who are agreeable. My suggestion is that 'young retirees' would be good people for this."

Denardo no longer has the time to conduct his own research, keeping occupied with his ongoing organizational and promotional activities for ICTP. But he is reluctant to take credit for his own influence in the nurturing of educational efforts in optics, which the Educator Award acknowledges. "I feel that the ICTP, together with me, deserves this honor," he says, and he cites the important support of the center director, Katepalli Sreenivasan. "Without the ICTP I couldn't have done anything."

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