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ing, since it only says that quantum mechanics is inconsistent with a local hidden variable theory and that quantum mechanics is intrinsically nonlocal. Much of what people consider the weirdness or paradoxical nature of quantum mechanics, he said, was really due to its nonlocality; people thought that it ought to be local.

What I remember most, however, is not Weisskopf's comment, but a story told by Stephan Berko, my freshman physics professor in 1966–67, who was also in the audience at that talk. After listening to the rather inconclusive discussion among Mermin, Weisskopf, and others, Berko recalled something that Bohr said to him—in fact, the only thing Bohr ever said to him directly. Berko had been visiting the Institute for Theoretical Physics in Copenhagen in 1958 and attended a holiday party, which featured a magic show. After watching some particularly baffling magic tricks, Bohr turned to him and said, "It's all done with smoke and mirrors!"

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An Early Route to MHV Tree Amplitudes

In the perturbative expansion of a gauge theory, large numbers of Feynman amplitudes combine to produce mathematically simple (and elegant) expressions. So many people had long suspected that deeper symmetry structures were involved, but those structures remained tantalizingly beyond reach until recently. The Search and Discovery story in the July 2004 issue of PHYSICS TODAY (page 19) gives a lucid and detailed explanation of the evolving understanding of symmetry structures that underlie Feynman amplitudes. Identification of the connection between the maximally helicity-violating (MHV) amplitudes for the $N = 4$ super Yang–Mills theory and super-twistor space was a crucial ingredient in the recent developments.

I would like to share the reasoning that led me, some years ago, to make an early proposal,¹ which unfortunately was not mentioned in the PHYSICS TODAY story. I noticed that the Parke–Taylor formula for the MHV amplitudes involved the inverse of scalar products of spinor momenta

that could be related to free fermion propagators (or current correlations of a Wess–Zumino–Witten theory) on the complex projective space CP^1 . The space arises naturally (as the fiber) in twistor space. Earlier, Edward Witten had observed that the constraints defining the $N = 4$ super Yang–Mills theory could be nicely interpreted in supertwistor space.² Putting these observations together, I wrote a formula for MHV amplitudes in $N = 4$ Yang–Mills theory in twistor language. Conformal symmetry plays an important role. Witten's recent work is more comprehensive, generalizing this complicated series of relationships to string theory and non-MHV amplitudes, and leading to many beautiful results that, for the special case of MHV amplitudes, are identical to mine.

The work I've just described may be useful for practical calculations; but beyond that use, I hope there will emerge a new organizational principle for perturbation theory other than expansion in terms of Feynman amplitudes.

References

1. V. P. Nair, *Phys. Lett. B* **214**, 215 (1988).

2. E. Witten, *Phys. Lett. B* **77**, 394 (1978).

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Suárez a Father of South American Astronomy

A limited amount of information is available on one of the first remarkable scientists born in South America: Buenaventura Suárez.

Born in the 1670s in Santa Fe, the first port city of Argentina (then part of the viceroyalty of Peru), he studied under the Jesuits at the College of the Immaculate Conception, which was very near his home and is still in operation today. After graduation, he entered the Jesuit seminary and attended the University of Córdoba (in Argentina), also founded by the Jesuits earlier in the 17th century. As a young priest, he was sent to the San Cosme and San Damián mission on the site of the present-day city of Posadas.

Along with a strong drive to help

and guide the Guarani Indians, Suárez also had a passion for astronomy. With Guarani assistants, he constructed basic astronomical instruments, including an elementary telescope. From 1706 through 1739, he observed, among other things, eclipses of the Sun and Moon and some of the satellites of Venus and Jupiter. The Jesuits had his astronomical predictions for the period 1740–1841 printed in Spain, in a book titled *Lunario de un Siglo* (*Solar Calendar for a Century*). In it, Suárez predicted solar and lunar eclipses and phases of the Moon. The last chapter gives guidelines for continuing the solar calendar up to 1903.

Around 1740, the old mission was abandoned, and the new San Cosme mission was founded across the Paraná River. The ruins of that second mission are very near the town of San Cosme and the city of Encarnación in present-day Paraguay. Suárez continued his astronomical observations there with more sophisticated instruments sent from Europe by the Jesuits. During his career, he exchanged information with scientists from Uppsala, Sweden; Peking, China; St. Petersburg, Russia; and Madrid.

Suárez died on 24 August 1750. Some years later, in 1763, King Charles III of Spain banished the Jesuits from all Spanish domains, and the missions were abandoned. Several decades later, the Spanish historian Félix de Azara found remnants of astronomical instruments while he was performing archaeological studies in the mission ruins. Important studies of Suárez's life and accomplishments have been done separately by Guillermo Furlong, a Jesuit, and L. Hillar Puxeddu, a lawyer and historian.

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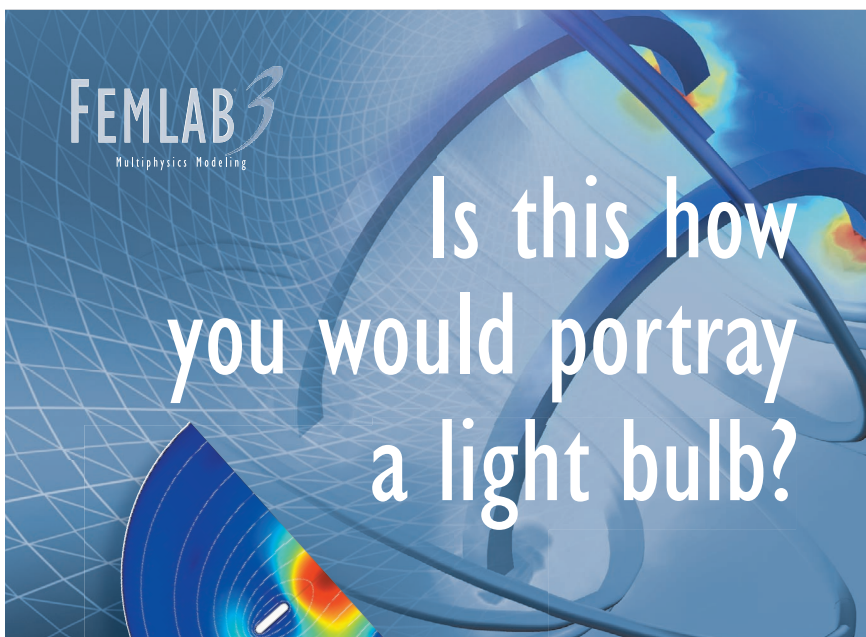
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Naming a Name in H⁻ Spectroscopy

The pioneer of H⁻ spectroscopy described in my Reference Frame article on Feshbach resonances (PHYSICS TODAY, August 2004, page 12) is Howard S. Bryant. I apologize for having gotten his name garbled.

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