Summer School in Nuclear Physics

Summary

We propose to organize an annual summer school in nuclear physics research, continuing the National Summer School in Nuclear Physics held annually since 1988. The school would bring together leading researchers to lecture on their specialties to advanced graduate students in experimental and theoretical nuclear physics. The overall goal of the schools is to provide students with a reference frame for defining critical problems of nuclear physics and the most useful methods of analysis of the problems. This addresses one weakness in the current nuclear research environment, which is the relative isolation of university-based nuclear research groups. We also expect that the close contact with leading researchers will be beneficial in increasing the number of students going on to productive research careers.

1. Introduction

We would like to continue the National Summer School in Nuclear Physics, which we feel has been very successful in providing experimental and theoretical graduate students with a perspective of nuclear physics as a research field. We will follow the original model quite closely as regards the format of the school. This is described in the next three sections. However, we propose a number of changes which couple the school to the Institute for Nuclear Theory. This will have the advantages of allowing the school to use the administrative resources of the INT, the physical facilities that can easily be arranged here, and some scientific component from the the summer program at the INT. The specific features of the proposed joint support are detailed in the the later sections of the proposal.

2. Motivation and History

The study of nuclear physics in the United States has become fragmented for several reasons. The number of physics (and chemistry) departments where nuclear studies are pursued has decreased, and the size of the research groups is often small. The disappearance of small accelerators as useful research tools has made the user mode of research more common, which does not provide a good environment for students. This will be exacerbated in the future when essentially all of the resources in nuclear physics will be concentrated in a few major facilities.

Under these conditions students can go through graduate training and postdoctoral experience without developing clear ideas of the important outstanding questions. The experimental physicist needs to know what properties of nuclei and hadronic interactions are most significant to measure to further knowledge in nuclear physics and in other areas that require nuclear physics input. The theoretical student needs to appreciate better the important criteria for useful models, and needs to be able to judge the significance of reported measurements.

In Europe, the summer school has proven to be a very successful way to deal with the problems of isolation within various countries. There are regular schools at Varenna, Italy, at Erice, Italy, and many NATO sponsored schools including the one at Les Houches, France. In Eastern Europe, there are regular schools in Poland, Hungary and the Czech Republic.

In this country, the NSF has sponsored regular advanced schools in the 1960's, an ad hoc nuclear physics school in 1979 and 1981, and SEVERAL series of nuclear schools since 1983. The PI was organizer of the 1979 and 1981 schools, and was PI on the grant supporting the series of schools 1988-1991. These schools were located at Oregon State Univ., Gull Lake in Michigan, University of California at Santa Cruz, and University of Wisconsin at Madison. Lecturers and students alike have been very enthusiastic about the stimulating physics atmosphere present at these schools. The final report of the Santa Cruz school is summarized in section 6 of this proposal.

There have also been ad hoc schools organized by Los Alamos, by Brookhaven, and by CEBAF. These schools are sponsored by the Department of Energy and are directed specifically toward the research capabilities of the local accelerator. The proposed school is quite different in that it aims to convey a broad perspective rather than focusing on the research program of a specific machine.

3. Requirements of the school

There are a number of important considerations to produce a successful advanced study school. First, one needs the best lecturers from the field. Second, the school needs a corps of students who have prospects for research careers and are at the appropriate level to develop a perspective of the research field as a whole. Third, the format of the school must allow enough time for thoughtful conversations and reflection on the material presented.

3.1 Location

It is important that the school be held in an attractive setting. The top researchers in a field are much more willing to serve as lecturers if the environment is pleasant and conducive to informal discussion. This is a major feature in the success of the European schools. It not only allows one to attract the lecturers, but they are more willing to stay the entire length of the school if it is in a nice setting. One of the criticisms of a series of schools held at Georgetown University was that many of the lecturers only stayed in Washington long enough to give their own lectures.

Another environmental requirement of the school is that the student and lecturers have many opportunities to interact informally as well as in the lecture hall. An isolated setting with housing and meals taken together provides the ideal in this respect. This is best achieved with a conference center in a vacation location, such as was done at Gull Lake, Michigan. Schools held on university campuses can also meet the conditions if careful arrangements are made. For example, the school organized by the PI on the Santa Barbara campus had a separate dining area for the school.

The recent National Nuclear Physics Summer School tried to achieve these site goals and rotate the site from year to year. While this helped make the school a community activity, it also led to a few organizational mistakes that grew out of inexperience. Sites were not uniform in quality, nor was the supporting administrative staff.

We propose using sites familiar to us from our experience with INT workshops and the independent Uehling summer schools. The first school, in 1995, would take place on the U. W. campus, during the June time period between the INT's spring and summer programs. In future years, with more lead time, other sites that are more isolated can be found. There are two possibilities that are very attractive. The first is a forest retreat near Mt. Rainier that is owned by the University. The second is the State Conference Center at Fort Worden, near Port Townsend in the Olympic Peninsula. Dormitory accommodations are available at both, as are seminar rooms, overhead projectors, etc.

3.2 Lecture format

Previous schools have been successful with the following format, which we propose to continue. The school is held for a two-week period, with lectures on weekday

mornings. This allows five to seven lecturers to present their subject, taking about five lectures apiece. At this pace, the lecture material is presented in a way that can be genuinely useful to someone learning the subject. The students also have an opportunity to present seminars on their own research. These usually take place in the late afternoon and evening.

The school attendance will be limited to about 50-60. This number is only partly dictated by space and financing limitations. The number cannot be made much higher and still preserve an informal and lively atmosphere in which the participants ask questions and take part in the discussion. With 50 students each year, there are also enough places that no nuclear physics graduate students near completing their Ph.D. would need to be excluded by the limitation.

3.3 The students

The school can only accomplish its purpose if it is attended by the students capable of becoming career researchers in nuclear physics. An important part of the organization of the school has to be the recruitment of these individuals. It is essential that the organizer of the school make a strong personal effort to recruit students by bringing it to the attention of all the research groups in the country. It is of course helpful to have a poster that is widely disseminated, but one cannot count on printed media to give adequate publicity, and personal contacts are vital.

Students can only be expected to attend if their travel costs are fully covered. In past schools, cost sharing between the school and the research group of the student's home university worked out well to support the participants. With some contribution to the support from the home institution, only students who are regarded by their professors as ready for the advanced school will be encouraged to attend.

4. Leadership and oversight of the schools

4.1 The organizer

It is clear than a well-organized school requires a lot of work and effort by some individual. This is the designated organizer of the school. He/she prepares the program of lecturers (subject to the approval of the steering committee), selects the students to attend, and manages the day-to-day activities of the school. He will be assisted in these tasks by one the experienced workshop coordinators of the INT, who will handle correspondence, do financial projections, and answer any travel or visa

questions. He has also had the main responsibility for recruitment of students. The organizer will be chosen by the steering committee from community volunteers.

We feel that the schools have benefited by the concentration of authority on a single individual, and we propose to continue this system, but somewhat modified. In addition to the organizer there would be a local coordinator who would be part of the INT, either a program coordinator or one of the permanent scientific staff. This will provide the organizer with knowledge of and access to the summer INT participants and the INT resources. We anticipate that the organizer will ask two or three of the summer program visitors to arrive two weeks early in order to lecture in the school. The remaining lecturers would be chosen from the general community.

4.2 Steering committee

An annual school is only possible with an organization that provides scientific continuity from one year to the next. We propose to continue the approach followed since 1988, having an ongoing, independent steering committee whose main responsibility is to find an organizer for the school. Before, the steering committee also had to find a site, but we propose the site arrangements now be made by the INT. As before, the steering committee is consulted on the program to assure that there is a proper balance. In addition, we expect that the steering committee will be very helpful in the recruitment of students. This can all be done by telephone and E-mail communication, and does not require actual meetings.

For the initial committee, we propose to have Jorgen Randrup as chairman, with B. Barrett, B. Mueller, the PI, J. Vary, V. Viola, V.R. Brown, S. Vigdor and W. Henning as members. All except Henning have been closely involved with past schools. It is important to have experimental representation on the committee to promote the goal of the school, to cover both experimental and theoretical nuclear physics.

From past experience it is clear that the committee should rotate with a rotating chairman to maintain the vigor of the effort. We propose to do this by limiting the term to three years, except for the PI, and by adding members to be chosen by the Executive Committee of the Division of Nuclear Physics.

5. Financial Support

We propose a cost sharing between the INT (and thus the Department of Energy), the National Science Foundation, and the University of Washington that will reduce

the annual cost to the NSF by nearly a factor of two.

The INT would provide its facilities and the staff help, cover the costs of the lecturers and organizers, provide a small honorarium to the lecturers, and take care of xeroxing, etc. The INT will also provide $5K to help with student travel, in cases where the home institution is unable to do so.

The University of Washington could provide unrestricted funds in the amount of $3-5K/year to be used for a number of summer school activities that are presently difficult to fund. These include a welcoming reception, Wednesday barbecues, and an outing during the weekend. This money would come from a fund provided by Ruth Uehling in honor of her deceased husband, Ed Uehling (of the Uehling potential). The school would be advertised as jointly supported by the NSF, the DOE, the Uehling fund, and administered by the INT. We ask the NSF to provide $20K/year to cover the housing and meal costs for the students while they remain in Seattle. The university does not charge overhead on this, so all of the grant would go directly to student support.

7. Proposal History

This proposal comes out of discussions with the Steering Committee for the National Nuclear Physics Summer School and was unanimously endorsed by it. It also has been presented to the INT's National Advisory Committee and the the Executive Committee of the Division of Nuclear Physics. Both bodies urged us to proceed.

PI: George F. Bertsch
CO-PI: Wick Haxton