

SIMON FRASER UNIVERSITY  
MEMORANDUM

To: Prof. L. Salter,  
Acting V.P. Academic

From: C.H.W. Jones, Dean  
Faculty of Science

Subject: **Physics External Review**

Date: February 21, 1990

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Please find attached the report of the Physics External Review Committee and the Department's response.

This review went remarkably smoothly, in part because several members of the review committee have had considerable experience in conducting reviews of academic departments and of government laboratories. However, it is also appropriate to comment that the Department was very well prepared and, in particular, the planning document and supporting material provided an excellent basis for the review.

The Department of Physics has, over the last 25 years, concentrated its appointments and its research efforts in one area, condensed-matter physics (CMP). The Department has been very successful in this, and the reviewers conclude that the SFU Physics Department is one of the two leading centres in this field in Canada and that it enjoys an excellent international reputation. The reviewers recommend that the present complement of faculty in CMP be maintained.

However, the reviewers also recommend modest expansion of the Department (4 new positions over five years) into a secondary area, that of theoretical particle physics/field theory. This would build on some current expertise in the Department and on the University's strong linkages to TRIUMF. The Department supports this finding.

The committee also recommends, and the Department strongly supports, that every opportunity should be taken to make "pre-emptive" appointments mortgaged against future retirements. This will be required to anticipate the very fierce competition for new faculty over the next 5-10 years, particularly in areas such as CMP where competition with industry is intense.

The report contains a range of constructive and useful recommendations concerning the undergraduate and graduate programmes and the Department will be actively addressing these over the coming months.

C. H. W. Jones  
C. H. W. Jones

CHWJ:pl  
Att.  
c.c. M. Plischke

# SIMON FRASER UNIVERSITY

## MEMORANDUM

To..... Dr. C.H.W. Jones .....

From Michael Plischke, Chairman .....

..... Dean of Science .....

..... Department of Physics .....

Subject.. PHYSICS DEPARTMENT  
EXTERNAL REVIEW .....

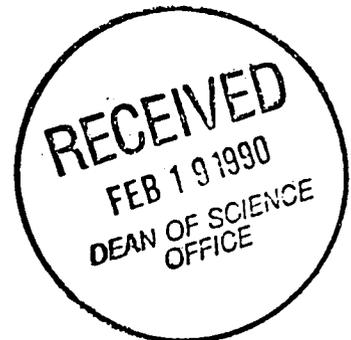
Date. February 19, 1990 .....

I enclose the Physics Department's response to the Report of the External Review Committee. Some of the comments of the Committee deal with the graduate and undergraduate curriculum. These suggestions will be discussed by our departmental graduate and undergraduate curriculum committees and we will respond when their deliberations are concluded. I believe that, in the meantime, the Report and our response can be sent to Senate.

*Michael Plischke*  
MICHAEL PLISCHKE

MP/ML

Enclosure: Report dated Feb. 19/90



PHYSICS DEPARTMENT EXTERNAL REVIEW  
February 19, 1990

Response to the report of the Review Committee

The Physics Department Review Committee has presented a thoughtful and perceptive analysis of the department and has made a number of constructive suggestions for future development. Several of the Committee's recommendations deal with the size and breadth of the department. We are in agreement with these recommendations and ask that the following action be taken in order to implement them.

The Committee recognizes that the Department's highly focussed research expertise in condensed matter physics has allowed it to build an international research reputation despite its relatively small size. However, the Department's age profile, in particular in experimental condensed matter physics, has become badly skewed and must be corrected as soon as possible. In view of the importance of this area of physics and in view of the impending shortage of high quality condensed matter experimentalists in the coming decade, we request a second junior position in experimental condensed matter physics at this time and mortgages of future replacement positions in each of the next three years. It must be emphasized that in this area of physics we are competing with industry, as well as with other universities, for the best people. For example, two of our top four candidates in the current search had attractive offers from American industrial laboratories.

The Committee also points out that we must now begin to diversify our research and graduate teaching base. Along with condensed matter physics, elementary particle physics is the other main area of frontier research in physics. This is a research area in which we have only one active researcher. As recommended by the Committee, we therefore request the creation of a new senior faculty position in elementary particle/field theory and three junior positions in this area in the next few years. The Committee argues strongly against weakening our existing strength in condensed matter physics and these positions must, therefore, be expansion positions rather than replacement positions.

We now discuss the Committee's other recommendations.

1. **THE UNDERGRADUATE PROGRAM**

(a) **Integrated 4-semester course sequence**

We agree that there are problems in our first year courses (120/121). In particular, most faculty who have taught these courses feel that there is too much material in the syllabus. An integrated four-semester sequence might be pedagogically attractive but could cause new difficulties, in particular for Community College transferees. This will be discussed in depth by the Undergraduate Curriculum Committee during the next few months and we expect to bring forward a proposal for some lower-level course revisions by the summer of 1990.

(b) **Methods of Mathematical Physics**

Physics 384 (Mathematical Physics) is the single most important requisite for our fourth year physics courses and some of our third year courses. In this course students are introduced to some of the classical methods of applied mathematics in the context of specific physical problems. The aim of this course is to teach the student to integrate the basic tools learned in the prerequisite Mathematics courses and to apply them in a systematic way to physics. We point out that such a course is the rule rather than the exception in North America. In particular, one of the members of the Review Committee (Baker) has been largely responsible for the development of the parallel course at the University of Washington.

(c) **Updating of Undergraduate Laboratories**

The department has plans to update the undergraduate laboratories and has consistently requested capital funds for this purpose.

(d) **Miscellaneous**

(i) We agree that rotation of teaching assignments is appropriate.

(ii) All basic courses do have well-defined syllabi. A suitable text will be identified for Phys 384.

- (iii) The Physics Department is responsible for NUSC 485 which is offered every spring. The comment in the review presumably refers to NUSC 442 which was not offered as a regular lecture course in 89-1 when a single student expressed interest. The student took the course as a reading course in Chemistry.
  
- (iv) We do use TRIUMF staff to teach in the department. In particular, in 90-1 Dr. B. Jennings is teaching NUSC 485 (Particle Physics). In 89-1 he taught Phys 425, advanced electromagnetic theory, in which relativity certainly plays a role. Some of our regular faculty also do research with relativistic particles (Boal, Viswanathan) and are more than capable of teaching relativity.

e) Enrollment

Enrollment in our upper-level courses has been growing steadily but, as pointed out by the Review Committee, could be better. We hope that a reorganization of the lower-level curriculum will help to attract more students to the Major and Honors programs.

We will also re-examine our recruitment programs and attempt to make them more effective.

2. THE GRADUATE PROGRAM

1. Breadth of Program

The Committee's recommendations are consistent with concerns raised in the Mission Statement of the department and in the Long Range Planning Document of 1988. We agree that there should be a more extensive set of graduate courses and, with the addition of more faculty, this problem should be solved. If there is a major expansion at TRIUMF if/when KAON is funded, more staff from that institution should become available for special topics courses.

## 2. Length of M.Sc. and Ph.D. Programs

Our Graduate Program Committee will examine the requirements for the M.Sc. degree in detail during the next few months. The trend in Canada seems to be toward a streamlining of the M.Sc. program. For example, the University of Toronto and the University of Waterloo both offer non-thesis M.Sc. programs. The University of British Columbia has less stringent research requirements than we do. These will be some of the options that we will consider.

One of the contributing factors to the length of both M.Sc. and Ph.D. programs is, undoubtedly, the heavy teaching load of those students without scholarships. The Faculty of Science Task Force on Teaching Assistants has determined that there is no 'research intensive' Canadian university in which graduate students are allowed to perform as much as 20 hours of work per week. The range in other universities is from six to twelve hours per week and we also must work toward this as a goal, both to remain competitive in the recruitment of students and to make the graduate program more efficient.

## 3. Relationship of M.Sc. and Ph.D. Program

The suggestion that the procedure of transferring from the M.Sc. to the Ph.D. program be streamlined will be discussed again. The Department recently lowered the requirements for transfer from the M.Sc. to the Ph.D. program and further changes may be appropriate.

## 3. THE RESEARCH PROGRAM

As Simon Fraser University continues to grow, each department must ask itself whether its size and breadth of research program is appropriate for a 10,000, 15,000 or 20,000 student university. Some departments have attempted to cover most of the sub-disciplines within their area and for them, growth simply means maintaining balance among the different subdisciplines.

The Physics Department, from its beginning, has specialized in only one of the major research subdisciplines of physics. The largest frontier research areas in physics are now condensed matter physics, in which we have considerable strength, and

elementary particle physics. We have one theorist and one experimentalist (joint appointment with TRIUMF) working in particle physics. We have attempted to maintain a teaching capability in this field through the appointment of Adjunct Professors from TRIUMF, but our research program is small.

The Review Committee has recommended that we select elementary particle/field theory as a new area of research expertise and that we add at least three or four new faculty members in this field. We welcome this recommendation and request that we be given a new senior position in elementary particle or field theory. We expect that this established scientist will build up the research program in this area over the next few years.

#### 4. DEPARTMENT RESOURCES

1. We are well aware of the age distribution of our faculty and, once again, request that a second appointment in condensed matter experiment be made at this time. We note that the second candidate recommended for appointment brings the department expertise in one of the new and exciting areas of condensed matter physics, as recommended by the Review Committee in its assessment of the research program.

While the next few scheduled retirements are entirely in the experimental group, it must also be noted that the age distribution of the condensed matter theory group is also badly skewed. We must work toward the long-term goal of a balanced age distribution in all areas and, after some renewal of the experimental group, will wish to search for junior faculty in condensed matter theory as well.

2. The technical support staff is excellent but too small. Although we have recently added a technician, we still do not have the technical support for the research program that we had in the early years of the previous decade.

3. We have recently hired a full-time Laboratory Instructor, Dr. Neil Alberding, who has as one of his responsibilities, the rejuvenation of the teaching laboratories. With a regular infusion of capital we believe that this task can be accomplished during the next few years.

4. We agree with the Review Committee's comments on start-up funds.

6. We agree with the Committee's assessment of the laboratory space situation. However, we are confident that two new experimentalists can be accommodated for a short period in the existing space.

5. PLANS AND DIRECTIONS FOR THE FUTURE

We are in full agreement with the point of view expressed in this section of the Review Document, namely that the Department continue to grow and to diversify its research capabilities through additional appointments in elementary particle theory. We also agree fully with the 'strategic recommendation' made by the Committee that we make pre-emptive appointments, mortgaged against future retirements in condensed matter experiment at this time. Because of our high profile in condensed matter physics, we will, at the present time, find it relatively easy to interest outstanding young scientists in a faculty position at SFU. However, if we neglect to begin the renewal of the Department at this time, we will be faced with the prospect of rebuilding in the early years of the next century - a much more difficult and expensive process.



MICHAEL PLISCHKE  
Chairman  
Department of Physics

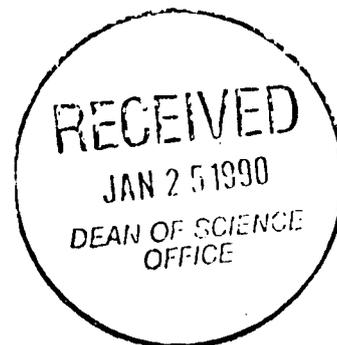
MP/ML

DEPARTMENT OF PHYSICS

University of California  
Santa Barbara, California 93106

Telephone: (805) 961-3495

January 18, 1990



Dr. C. H. Jones, Dean of Science  
Department of Physics  
Simon Fraser University  
Burnaby, British Columbia V5A 1S6  
Canada

Dear Dean Jones,

On behalf of the Physics Review Committee I am enclosing our report.

We thank you for the excellent arrangements for our visit. It was a pleasure meeting with you and other members of the SFU community. As you will read we have high expectations for the future of this excellent department.

Sincerely Yours,

A handwritten signature in cursive script that reads "W. Kohn".

Walter Kohn  
for the Committee

WK:c

enc.

cc: Academic Vice President, L. Salter

January 18, 1990

**Report of the Review Committee**

**Department of Physics**

**Simon Fraser University**

INTRODUCTION

The review took place December 5-6, the first review—we were told—after more than ten years. The Committee membership consisted of R. Armstrong, Dean of Arts and Sciences and Professor of Physics, University of Toronto (experiments on phase transitions and molecular dynamics); M. Baker, Professor of Physics, University of Washington, Seattle (elementary particle theory); R. Donnelly, Professor of Physics, University of Oregon at Eugene (experimental fluid mechanics, low temperature physics); R. Dynes, Director of Chemical Physics, Bell Laboratories, Murray Hill, N. J. (condensed matter experiment); and W. Kohn, University of California at Santa Barbara (solid state theory, surfaces). Four of the members have Masters' degrees from Canadian Universities. Donnelly and Kohn were originally nuclear physicists.

The Department Chairman, Professor M. Plischke and Dean of Sciences, C. Jones, provided us with excellent descriptive and statistical material

about the background, current status and future plans of the department. By consultation between Dean Jones, Chairman Plischke and the Committee Chair, a very satisfactory agenda was established, including meetings with faculty, students and administrators as well as visits to numerous research and teaching laboratories (Appendix A). A well formulated set of questions (Appendix B) guided our deliberations. We greatly appreciated the friendliness and frankness during our meetings.

We find that the Department has succeeded in establishing itself as one of the leaders in Canadian Condensed Matter Physics (CMP) and enjoys an excellent international name. Although the youngest member of the Department celebrated his 40th birthday during our visit, the spirit of the Department is impressively youthful. All but one member have research grants and/or industrial support. The level of mutual supportiveness in CMP is very high and a major contributor to the Department's excellence. Undergraduates made an outstanding impression on us; graduate students, as a group, somewhat less so. By far the greatest number of faculty and graduate students work in CMP or closely allied areas. There are some problems with several of the  $\sim 4$  faculty members outside of CMP. We foresee an excellent future for the Department which we expect to remain one of the ornaments of the University.

More detailed analysis and recommendations for the future follow.

## I. The Undergraduate Program.

We met with undergraduate students and had a lively and very positive discussion with them. Their morale was excellent. Several students had recently met with students from other Canadian universities and had concluded that their own education was superior. We were struck that all these students came from the Vancouver metropolitan area. They gave two clear reasons for coming to SFU: The wide variety of available Physics majors; and the coop program which offered them industrial experience and the opportunity to earn money. The students identified very positively with SFU and its physics department. Almost all had well thought out plans for their future. We were pleased with the significant percentage of (highly articulate) women students.

When encouraged by us the students also acquainted us with some problems in their curriculum. We took these comments into account in the following assessments and recommendations.

1. The undergraduate program is very thorough and on the whole very well taught. There is convincing evidence that the undergraduate students are very able and received an excellent education.
2. We support the reorganization of the program currently underway in the department, particularly with respect to the first two years. We recommend:

A single, integrated 4-semester course sequence, (including modern physics) during the first two years.

A 2-semester sequence in upper division electricity and magnetism at about the level of Corson and Lorraine.

A 1-semester, upper division course in classical mechanics, including Lagrangian methods and emphasizing applications.

Consideration should be given to having methods of mathematical physics taught by mathematics faculty. (Physics faculty needs to be involved in establishing the syllabus.)

3. The undergraduate laboratory is well organized but needs updating over the next few years.

4. Miscellaneous:

In general courses should not be taught more than 3 years in a row by the same instructor.

All basic courses should have texts and well-defined syllabi.

The nuclear science option is highly regarded. However, problems concerning the availability of one or two low-enrollment courses need attention.

Strong consideration should be given to having relativity taught by TRIUMF staff who do research with relativistic particles.

Concerning enrollment and graduation patterns we offer the following remarks.

5. We consider the present class of ~15 per year too small for the size and quality of the faculty and recommend a target of a 20-30% increase over the next five years. The Department should actively recruit students not only inside but also outside the Metropolitan Vancouver area.
6. The Vice Chancellor expressed concern about non-completion of the major. We have no statistical information about the first two years when many students switch departments. However we were told that ~85% of the students declaring a physics major complete the degree. We consider this very satisfactory.

## II. The Graduate Program

The Committee had an extended meeting with about 15-20 graduate students.

We asked them initially why they had come to SFU: the unanimous answer was the CMP program.

We asked them about support. Apparently all students are adequately supported by either teaching appointments, research appointments or combinations of both. Graduate student teaching is governed by union agreement and involves 20 hours/week including preparation. The Committee noted considerable concern about the heaviness of that load: apparently

quite a number spend 4 of their 6 years teaching.

The students, on the whole, believe that the MSc program is a good program but takes too long. Many felt they would like to go directly to the Ph.D. program, which is in principle possible. The minimum GPA for this transfer is 3.67 and permission of the student's committee.

With 20 hours of teaching, the students take only two courses at a time: Quantum Mechanics, Electricity and Magnetism for the first semester, Statistical Mechanics and Solid State 1 for the second semester. For the MSc they need 17 hours which usually includes Solid State II and one other class of choice. For the Ph.D. Quantum Mechanics II, particle physics and a choice of special topics is required.

The students felt that the core graduate courses are well taught, special courses less so. They complained that the choice of courses after the core was too limited. In particular they felt a field theory course should be available, as should group theory from a solid state viewpoint, and non-linear optics.

Students felt their relationships with almost all faculty were good and in fact those relationships constitute one of the motivations to come and stay at SFU.

Every student now gives a 20 minute seminar every year. This program is very popular and useful.

## Committee Comments and Recommendations

### 1. Breadth of Program.

The Committee believes that the curriculum is competently handled, but is, unfortunately, too limited. Theoretical students especially lack sufficient courses to give them the necessary breadth and depth to supplement their research and be adequately prepared for their career. We believe there should be a full year of E & M, and a year of relativistic QM and QFT. Furthermore, there should be more regular offerings of special topics courses such as group theory and nonlinear optics, as mentioned by the students. Special lecture courses by faculty from UBC or staff from TRIUMF would be an important addition to graduate studies at SFU. We recommend that the Department require each student to take 1 or 2 approved courses in an area far from his research. A broad range of graduate course offerings will help significantly in attracting high quality students.

For implications concerning the future size and composition of the faculty, see Section 4 and 5.

### 2. Length of MSc and Ph.D. Programs

We consider the average times for the completion of the MSc program ( $\sim 3$  years) and the Ph.D. program ( $\sim 6.2$  years) too long for the good of the students. We recommend that normally financial support be limited to 2 years for the MSc degree—or possibly 5—and a total of 6 years for the

Ph.D. degree.

### 3. Relationship of MSc and Ph.D. Programs.

Strong MSc programs are a prominent feature of Canadian graduate education. Compared to U.S. Master's degrees, which are all too often consolation prizes, the SFU MSc program is a solid program useful to certain students, going on to the Ph.D., and particularly useful for those leaving at the end of the Master's program. MSc theses should however be moderate in scope and length to make possible the shorter completion time for the degree. For students destined for the Ph.D., we consider it important to have a readily available direct access to the PhD program. This will help shortening the average time taken for the Ph.D.

### 4. Student Recruitment

The merits of the SFU graduate program should be more widely known and an increased effort to recruit, both nationally and internationally (particularly in the US Pacific Northwest), is recommended.

### 5. Evaluation

In the long run the quality of a graduate program will be reflected by the number of doctoral graduates who obtain positions in leading research institutions and their subsequent careers. Research opportunities in condensed matter physics (especially experiment) are truly outstanding today and the Committee looks forward to seeing SFU graduates playing scien-

tific leadership roles in the future. The enhanced teaching program and new research opportunities afforded by an expanded faculty (see Sec. 5), combined with more vigorous student recruitment, should help achieve this important goal.

### III. The Research Programs

1. Overall quality as measured by external research grant support, external recognition and honours, research productivity, etc.

From the Department's beginning the faculty has focused on CMP as area of specialization and this strategy has served them well. While the quality of the individual researchers in CMP varies from world competitive to average, the heavy focus on condensed matter physics and the strong interactions amongst the faculty result in a very strong total program, which gives the university an international reputation: the whole is considerably stronger than the sum of the parts. It should be regarded with pride that all of the condensed matter people have operating grants, with the average well above the national average.

The remaining faculty in other areas of physics, although feeling various degrees of isolation, have also demonstrated strong research programs and are well funded from outside grants.

2. Area of strengths and weaknesses in the research program.

CMP clearly is strong. We do not suggest that the department should

have representation in all areas of physics, but a strengthening through perhaps two new appointments in high energy theory would greatly add to the intellectual breadth of the department.

The directions of research in CMP reflect very much the age distribution of the faculty, where the youngest member is 40 years old. Even in CMP there are current areas of interest which are not represented at Simon Fraser. For example, the whole area of quantum transport and mesoscopic systems is of strong current interest and will continue to be for at least the next five years. CMP is inevitably dependent upon high quality, well characterized materials. It is, in part, the strength of Simon Fraser that it has strong efforts in synthesis of layered chalcogenides and magnetic systems. Another important area of CMP is semiconductor physics which relies heavily on quality materials. If an appropriate person can be identified, semiconductor film growth (MBE, LPE or MOCVD) would greatly enhance the breadth and productivity of the condensed matter physics people. However, such persons are difficult to find and unless unique circumstances occur which present the opportunity to hire a strong person in this area, this should not be pursued. Compromises should not be made here as a rather substantial investment is necessary for a program of this type. Finally, a carefully chosen experimentalist in the area of macromolecular systems, liquid crystals, polymers, or liquid instabilities would complement the strong theory group in this area.

#### IV. Department Resources

1. The age profile is badly skewed, the youngest member being 40 years old. Five faculty members, all condensed matter experimentalists, reach the canonical retirement age between 1992 and 1996. This includes A. S. Arrott who holds the largest NSERC operating grant, and has received significant recognition for his research achievements. We were told that the Department presently had one slot for a condensed matter experimentalist; if the opportunity presents itself to make a second appointment we would hope that the Administration would make the necessary resources available. (See end of Section 5.)
2. The administrative and support staff is lean but, from the comments we heard, seems in general to be adequate. Appreciation was expressed for the work done by the common Faculty workshop. It was noted that there are no Departmental charges levied from NSERC grants for technical or workshop support. This is a desirable situation which should be maintained.
3. The undergraduate teaching laboratories are well organized and satisfactory. A recently organized 4th year computer interface laboratory was particularly impressive. However, the equipment is in some cases out of date. A regular infusion of funds for the orderly replacement and upgrading of laboratory equipment is recommended.

4. The equipment available for graduate research and more generally for the research programs of the faculty is of high quality and often state of the art. In particular, the Surface Physics Laboratory is impressive and represents a unique faculty in Canada. However, it will be necessary to provide substantial start-up funds to attract junior faculty. In some cases sums of \$300,000 plus may be necessary in the present competitive environment.
5. The computing and library facilities are by and large satisfactory. The proximity of, and access to the more comprehensive UBC library is a definite asset. Certain journal subscriptions cancelled during the period of cutbacks should be reinstated. The mechanics for the purchase of new books appears to be too slow.
6. The laboratory space available to individual faculty appears to be ample. Nonetheless, on the short term, there will be a serious problem if one or more new experimental faculty are recruited before additional space becomes available with the completion of a new building for the biological sciences.

#### V. Plans and Directions for the Future.

We consider the Department's present very good state to be an excellent base for its future development: The Department has a broad, strongly interrelated high quality set of activities in condensed matter physics (CMP);

an excellent undergraduate student body; and a substantial number of graduate students (we believe of lower quality) and of postdocs and research associates. It has indeed succeeded in establishing itself as one of the two leading Canadian Centers of CMP and has a strong international presence. The present number ( $\sim 19$ ) of faculty in CMP is comparable with many of the strongest departments in North America and we see no general need for a larger number. Of course special circumstances (e.g. the establishment of an industrially endowed chair) may call for a modest increase. As present CMP faculty retire in the next few years ( $\sim 5$  before 1996), new appointments of young CMP faculty should be made, moving into new areas of opportunity and phasing out some older efforts.

Is continued concentration in CMP wise? We are convinced that it is. The field exhibits an enormous variety and vitality and is the essential base for contemporary high technology. It is intellectually challenging and continues to be the origin of a large fraction of the important new concepts for physics as a whole (collective phenomena, quantum Hall effect, renormalization group, etc.). On the experimental side it offers great scope for physical imagination and creative instrumentation, of which we saw several important examples at SFU. It will be important, though, for the department to move into new subfields of CMP, as opportunities are perceived.

Given the anticipated future size of the Department, about 26 FTE's

within the next 3-5 years, we consider wide diversification—and the concomitant absence of critical mass in each area—as clearly undesirable. At the same time we believe that an essentially one-dimensional Department (CMP only) is also highly undesirable in depriving both faculty and graduate students of the stimulation and openmindedness provided by more than one scientific perspective. We therefore strongly recommend that the department develop one secondary area which—by making use of some common interests with CMP and with faculty and staff at UBC and TRIUMF;\* would effectively have a critical mass. As one promising possibility for this secondary area we propose theoretical particle physics/field theory, an idea which agrees with the present thoughts of several faculty members. Joint appointments with UBC and/or TRIUMF should be seriously considered—they might be very helpful in recruiting. We consider a total of 4-5 SFU FTE's in this area a minimum. The first new appointment should be a senior appointment, the others junior.

As further means for keeping faculty, research staff and students in touch with a broader range of scientific developments we suggest that consideration be given to a regular program of Visiting Professors (in-and outside of CMP), say ~2 semesters per year, who would be asked to give special

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\* We are aware that a decision on TRIUMF's possible major transformation into a proposed KAON factory is pending. We believe that if it goes ahead it would enormously raise the quality of the overall scientific environment in British Columbia.

courses and seminars.

Finally a very important strategic recommendation: The competition, particularly for good CMP experimentalists, has already become very fierce over the last 3 or 4 years and reliable projections make it next to certain that it will become even much fiercer as the retirement wave grows towards its peak in a few years. Therefore it is essential to make "pre-emptive" appointments now, mortgaged against future retirements. Failure to do so might well endanger the long term future of this Department.

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Walter Kohn, Chair  
For the Committee

WK:c

PHYSICS DEPARTMENT EXTERNAL REVIEW  
December 4-7, 1989

ABSOLUTELY FINAL SCHEDULE

Monday,

December 4 19:30

DINNER  
 C.H.W. Jones and Review Committee  
 at Hotel

Tuesday,

December 5 7:30

Committee, M. Plischke at Hotel

8:45

L. Salter, C.H.W. Jones (V.P. Academic office)

9:45

Graduate Students; E.D. Crozier,  
 M. Plischke for Graduate Curr./Admiss. Comm.

10:35

R.F. Frindt, S.R. Morrison, K. Colbow

11:25

M. Thewalt

11:50

LUNCH (P8445)

13:10

Undergraduate Students; R. Frindt  
 for UGCC (P8445)

14:05

J.C. Irwin

14:30

O. Häusser

15:00

COFFEE, Science Chairs

15:45

R.H. Enns, K.S. Viswanathan

16:30

B.P. Clayman, S. Gygax

17:00

B.P. Clayman (Graduate Studies)

17:45

Committee meets in camera

19:00

DINNER (Committee, Plischke, Clayman, Cochran,  
 Colbow, Crozier, Irwin, Rieckhoff, Viswanathan,  
 Wortis at Diamond University Club)

21:00

Return to Hotel

../2

All meetings in Physics Seminar Room (P8445) unless indicated otherwise

Wednesday,

December 6

9:00 L.E. Ballentine, G. Kirczenow  
9:40 D.H. Boal, M. Plischke, M. Wortis  
10:40 Surface Physics Laboratory  
(Arrott, Cochran, Curzon, Heinrich)  
12:15 LUNCH (T.W. Calvert, Diamond Univ. Club)  
13:45 Tour of Teaching Laboratories (Frindt)  
14:15 E.D. Crozier  
14:45 K.E. Rieckhoff  
15:10 L.H. Palmer  
15:30 Committee meets in camera  
19:00 DINNER (Committee)

Thursday,

December 7

Committee meets at Hotel

All meetings in Physics Seminar Room (P8445) unless indicated otherwise

## Physics Review - Terms of Reference

The objective of the review is to provide a critical and constructive analysis of the S.F.U. Department of Physics from the following standpoints:

### 1. The Undergraduate Programme

- a) the appropriateness of the curriculum
- b) the quality of the programme
- c) enrolment patterns and the number of students graduating in Physics.

### 2. The Graduate Programme

- a) requirements for the M.Sc. and Ph.D. degrees
- b) the quality of students who graduate
- c) levels of graduate student support and related matters (e.g. time taken to graduate).
- d) enrolment patterns in the M.Sc. and Ph.D. programmes (Canadian vs. international student enrolments; M.Sc. vs. Ph.D.)

### 3. The Research Programmes

- a) Overall quality of the faculty as measured by external research grant support, external recognition and honours, research productivity, etc.
- b) Areas of strength and weakness in the research programmes
  - i) depth versus breadth
  - ii) appropriateness or otherwise of current research thrusts.

### 4. Department Resources

- a) Faculty complement; age profile; retirements, etc.
- b) Support staff complement - technical and non-technical
- c) Equipment for undergraduate teaching and graduate teaching and research
- d) Laboratory facilities
- e) Computing and library facilities.

## 5. Plans and Directions for the Future

- a) Concentration in condensed matter physics vs. diversification
- b) TRIUMF - where does this major facility fit in?
- c) Replacement and new appointments - by area
- e) The national and international stature of the Department - how best to build on and add to the Department's current status.

### Report

A report of 8 to 20 typed pages would be appropriate. The Report should be submitted to the Dean of Science and the Academic Vice-President, who will, following discussion, release it to the Department. The document will then essentially become public. It is current practise for such reports to be submitted to the Senate Committee on Academic planning and to the University Senate itself.