Curriculum Vitæ – Henry Edward Fischer

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Birth: 19 August 1962 in Rolla, Missouri, USA
Nationalities: French (naturalized 17 Sept 1999), American   Family situation: single

UNIVERSITY DIPLOMAS

DHDR Université Joseph Fourier (Grenoble I), Physique, Dec 1997
Président du jury: Denis Raoux

Ph.D. Cornell University, Solid-State Physics, Jan 1990
Thesis title: Thermal transport in solids – diffusive and radiative regimes
Thesis director: Professor Robert O. Pohl

M.Sc. Cornell University, Physics, Jan 1988

B.Sc. Purdue University, Physics and Mathematics (summa cum laude), May 1984

PROFESSIONAL EMPLOYMENT

since 4/04: Physicist and instrument responsible of the D20 neutron powder diffractometer in the diffraction group of the Institut Laue-Langevin (ILL), Grenoble, France. Research program: structure and dynamics of liquids, glasses and disordered crystals.

9/99 – 3/04: Professor of physics (tenured) at Université Paris-XI (Paris-Sud) in the condensed matter section (28ème CNU); laboratory: Laboratoire pour l'Utilisation du Rayonnement Électromagnétique (LURE), Orsay, France. Research program: structure and dynamics of liquids and glasses using x-ray and neutron scattering.

8/94 – 8/99: Physicist and instrument responsible of D4 (neutron diffractometer for liquids and amorphous materials) in the diffraction group of the ILL, Grenoble, France. Research program: structure and dynamics of liquids and glasses, in particular "glassy behavior" in glasses and disordered crystals.

10/92 – 7/94: Postdoctoral researcher (Chateaubriand fellow) at LURE, Orsay, France. Research subjects: structural determination of multilayers using synchrotron x-ray diffraction; giant magnetoresistance in magnetic superlattices.

2/90 – 9/92: Postdoctoral researcher at McGill University (Centre for the Physics of Materials), Montréal, PQ, Canada. Research subjects: synchrotron x-ray diffraction in real-time of rapid crystallization in metallic glasses; low-temperature measurements of weak localization in metallic glasses.

9/84 – 1/90: Thesis student and research assistant at Cornell University (Laboratory of Atomic and Solid State Physics), Ithaca, NY, USA. Research subjects: low-temperature specific heat of "heavy fermion" systems; thermal properties at high-temperature measured with a heat-pulse technique; low-temperature thermal properties of high-T_c superconductors; measures and "Monte Carlo" simulations of phonon blackbody radiation at very low-temperature in perfect silicon crystals.

summer 1983: Research assistant at Yale University (Council of Engineering and Applied Sciences), New Haven, CT, USA. Research project: acoustic levitation of oil droplets in water, towards possible applications in tertiary oil recovery.

Research Activities

Certain themes emerge from the variety of research that I've pursued over the course of my career. For the most part, this research in condensed matter physics has concerned scattering (neutrons, X-rays, phonons) studies of disordered systems (liquids, glasses, alloys, interfaces, surfaces), as well as some work on strongly correlated electrons (high-T_c superconductors, heavy fermion systems, magnetism). I've worked at several laboratories and universities in different countries.

since 4/04 (ILL, Grenoble). Physicist and responsible of the D20 instrument (diffraction group leader: Dr. Juan Rodriguez-Carvajal).

A few years ago I thought of trying to observe the onset of ferromagnetic ordering in a liquid alloy by following the evolution of the magnetic correlation length near T_c, being directly measurable by diffraction of non-polarised neutrons. The sample can be suspended in an undercooled state by the technique of aerodynamique levitation coupled with laser heating, developed by the CRMHT laboratory in Orléans (group of Louis Hennet and David Price). This levitation technique allows *in situ* diffraction measurements (neutrons and x-rays) and EXAFS on liquid samples at very high temperature (up to 3000 K or more). The absence of a container permits as well a good degree of undercooling.

I learned that some work had already been done looking for ferromagnetic ordering in liquid $Co_{80}Pd_{20}$ using levitation techniques, but not yet any neutron diffraction, which should be sensitive to magnetic ordering because of cobalt's appreciable magnetic scattering length. The experiment on $Co_{80}Pd_{20}$ that I proposed at D4c received very high marks from the College 6 subcommittee, and showed small-angle scattering that is likely coming from magnetic scattering (see experimental report 6-03-309). I then wrote a follow-up SANS proposal for the D22 instrument whose experiment in June 2005 yielded a magnetic correlation length of about 10 Å at 1300 C.

I'm also quite interested in doing more D4c experiments using H/D or $^{12}C/^{13}C$ isotopic substitution for partial structure factor determination, having applications to hydration structures in biological solutions, for example. As a start, I've begun a collaboration on the structure of sub-critical and super-critical fluid CO_2, using $^{12}C/^{13}C$ substitution at D4c. An outstanding question is whether neighboring CO_2 molecules have a tendency to adopt a "T"-like configuration or a staggered-parallel configuration, for which partial structure factors are needed to give a satisfactory answer. We intend as well to combine our neutron diffraction results with high-energy x-ray diffraction results so as to increase further the available scattering-length contrast.

In general I believe that the D4c instrument is underexploited for H/D and $^{12}C/^{13}C$ substitution experiments. The study of the structure of biological solutions is an important complement to diffraction studies of biological crystals, in that the molecules of the latter do not necessarily adopt the same secondary and tertiary structures as those in solution that are needed for biological functions.

Within the relatively wide field of structure and dynamics of liquids and glasses, I favor the view that the structure of liquids offers the most interesting possibilities. A liquid is an equilibrated, reproducible system to which thermodynamics can be applied, whereas a glass is a non-equilibrium system whose structure for a given stoichiometry can be dependent on sample preparation. I also think that the field of study of the dynamics of glasses, for example, has a tendency to drift into rather phenomenological interpretations of experimental results. Modeling and numerical simulation techniques have reached a point where ab-initio simulations of systems containing several hundred molecules are possible, allowing increasing possibilities for comparisons between experiments and theory.

Finally, I've gained some interest in performing PDF analysis experiments at the D4c instrument (*i.e.* taking a Fourier transform of a powder diffraction pattern), as a complementary technique to more conventional Rietveld analysis, especially for disordered crystals or those having defects. Preliminary results from D4c are encouraging.

<u>9/99 – 3/04</u> (Université de Paris-Sud, Orsay). Professor of physics in the condensed matter section (28ème CNU); laboratory: LURE, Orsay.

The research program that I pursued at Université de Paris-Sud (Paris-XI) concerned the study of the structure and dynamics of liquids and glasses by synchrotron X-ray diffraction and neutron scattering. This program was largely a continuation of the research that I carried out at the Institut Laue-Langevin during my first 5-yr contract (8/94 – 8/99), while putting more emphasis on the techniques of X-ray diffraction.

I wrote and submitted 3 LURE beamtime proposals, all of which were accepted and gave good results for X-ray diffraction and absorption (EXAFS) on liquids and glasses, a field of study not yet well-developed at LURE. I was able to bring in new user groups to LURE.

<u>8/94 – 8/99</u> (ILL, Grenoble). Physicist and sole responsible of the D4 instrument (diffraction group leader: Dr. Alan Hewat).

My personal research programme during my first 5-year contract at the ILL centered around the study of "glassy" behaviour, meaning various properties that are universal to amorphous solids and also found in certain disordered crystals, including: a linear specific heat and a T^2 thermal conductivity for $T \lesssim 1$ K, particular elastic properties and excess vibrational modes at low-temperature, and characteristic relaxation behaviour near the glass transition temperature T_g. Whereas quantitative microscopic models for glassy behaviour exist for some disordered crystals, where the presence of an atomic lattice makes computer simulations more feasible, explanations of glassy behaviour in amorphous solids have been for 25 years essentially limited to phenomenological models, such as the two-level systems (TLS) model for low-temperature thermal and elastic properties.

By studying a system that can exist at a given temperature, pressure and stoichiometry as both an amorphous solid and a disordered crystal exhibiting glassy behaviour, one can hope that a microscopic model for the disordered crystal could lead to a better description of glassy behaviour in the amorphous phase. It turns out that ordinary ethyl alcohol (ethanol) is such a system, and therefore became the focus of my personal research at the ILL (in collaboration with F.J. Bermejo of CSIC Madrid and others). The orientational glass (OG) phase of ethanol is a bcc crystal where the molecules have random fixed orientations at lattice sites, with molecular rotations setting in above $T_g^{\mathrm{OG}} \approx 97$ K, this temperature being in fact almost identical to T_g for the liquid/amorphous glass transition.

Through a combination of neutron diffraction and inelastic neutron scattering experiments, as well as low-temperature specific heat measurements, we have shown that several aspects of glassy behaviour in the OG and amorphous phases are quantitatively very similar, strongly suggesting that the origin of glassy behaviour in these phases is due to orientational disorder (present in both) rather than positional disorder (present only in the amorphous phase). An obvious candidate for the TLS would therefore be rotational tunnelling sites. The fully-ordered monoclinic phase of ethanol shows no glassy behaviour and serves as a baseline for comparisons. I wrote 2 ILL proposals (IN16 instrument) in the aim of observing directly the inelastic scattering from TLS in the amorphous and OG phases. The proposals received very high marks, but given the low TLS density of states and long TLS relaxation times, the desired results were outside the range of performance of the instrument.

From our neutron scattering experiments at high-pressure, we have learned that the glassy dynamics (low-energy vibrational modes) of the amorphous phase is more affected by anharmonicity in the intermolecular potential than is that of the OG phase, a result consistent with low-temperature specific heat data as well as with light Brillouin scattering measurements (H.E. Fischer, *et al.*, *Phys. Rev. Lett.* **82**, 1193 (1999)). Interestingly, T_g^{OG} is more dependent on pressure than is T_{g}. Our dielectric spectroscopy results show that both the α and β relaxations are manifested by the OG phase near T_g^{OG}. Theorists in our collaboration developed a quantitative microscopic model of "thin needles" for the dynamics of the orientational glass transition in ethanol (M. Jiménez-Ruiz, *et al.*, *J. Phys. Condens. Matter* **14**, 1509 (2002)).

In my opinion, the principal motivation for studying ethanol is that it offers a clean empirical separation of two qualitatively different sources for glassy behaviour: positional and orientational disorder, in a field otherwise so often dominated by complex phenomenologies.

Other than my personal research on glassy behaviour, I participated in and encouraged a number of other collaborations involving neutron scattering at D4 and other ILL instruments (see publications list), principally concerning the determination of partial structure factors and intermolecular potentials in fluids and glasses, as well as studies of critical behaviour and phase transitions in these systems.

In addition, I managed to continue some aspects of my previous research (from LURE, Orsay) on specular and off-specular X-ray diffraction from multilayers and the correlation between interfacial structure and their physical properties (*e.g.* giant magnetoresistance in Fe/Cr superlattices). I developed an X-ray data analysis program which is now used by several laboratories in Europe and can be adapted to the analysis of neutron reflectometry data.

10/92 – 7/94: (LURE, Orsay). Postdoctoral researcher (Chateaubriand fellow). Collaborators: Drs. Michel Bessière and Simone Lefebvre (formerly at LURE), the group of Prof. Michel Piecuch (U. Nancy I), Dr. Rainer Schad (formerly at U. Leuven), and others.

Structural studies of magnetic metallic superlattices using synchrotron X-ray radiation. In an effort to understand the novel physical effects in metallic superlattices (such as giant magnetoresistance and enhanced atomic magnetic moments), we employed anomalous dispersion X-ray scattering techniques at both large and small angles (and both specular and off-specular) to determine the structures (especially interfacial) of Fe/Cr and (MnFe)/Ir superlattices. These structural studies were performed in parallel with measurements of magnetic properties. We found, for example, a clear connection in Fe/Cr superlattices between the correlation length of interfacial roughness and the spin-dependent contribution to the giant magnetoresistance. My simulation/fitting program for analysing the specular and off-specular X-ray data has also been applied to other multilayer systems.

2/90 – 9/92: (McGill Univ., Montréal). Postdoctoral researcher. Collaborators: Profs. Mark Sutton and John O. Ström-Olsen.

Time-resolved X-ray scattering studies of very rapid cristallisation of amorphous metallic alloys. By using a millisecond time-resolved X-ray scattering technique at the National Synchrotron Light Source, we obtained *in situ* both large-angle and small-angle diffraction patterns for isothermal crystallisation of the metal-metalloid glass $Fe_{1-x}B_x$ ($0.16 < x < 0.21$) and the metal-metal glass $Co_{1-x}Zr_x$ ($0.08 < x < 0.11$) over several decades of crystallisation rate. Combining our X-ray results with TEM studies, we determined the temperature and composition regimes of eutectic nucleation and growth (producing an intricate lamellar-like structure for the two resulting crystal phases), and proposed a description of the crystallisation kinetics in terms of an atomic diffusion model.

Low temperature measurements of weak-localisation effects in amorphous metallic alloys. Magnetoresistance measurements on pure metals and alloys have often been employed to observe quantum-mechanical weak-localisation effects due to coherent back-scattering of the wave functions of the conduction electrons. We undertook a study of such effects in amorphous metallic alloys at very low temperature (~ 100 mK) and for various sample geometries, including those which reduce the dimensionality of the system to one or two dimensions. Our experiments were unique in that they concerned systems with very weak spin-orbit scattering that could be tuned by doping with heavy atoms.

9/84 – 1/90: (Cornell Univ., Ithaca). Thesis student and research assistant. Thesis advisor: Prof. Robert O. Pohl.

Measurements and Monte Carlo simulations of phonon blackbody radiation. In pure single crystals at very low temperature (<1 K), the thermal transport is no longer diffusive but must be described in terms of phonon blackbody radiation. In this ballistic regime, the phonons are scattered only at the crystal surfaces, which can be modified by controlled surface treatments. By comparing experimental results for low temperature thermal conductances of pure silicon crystals with Monte Carlo simulations (programs that I developed) for the phonon transport in the same experimental geometries, I was able to determine the magnitude of the phonon scattering at the crystal surfaces to very high precision, as well as to model other geometrical effects of radiative heat transfer.

Specific heat, thermal conductivity and electrical resitivity of high temperature superconductors with S.K. Watson and D.G. Cahill. By compiling data for these 3 properties of the high temperature superconducting compounds $YBa_2Cu_3O_{7-\delta}$ and $La_{2-x}Sr_xCuO_4$ from many researchers, as well as data for other better characterised compounds, we were able to conclude that more controlled sample preparation and characterisation are needed to eliminate (or accurately estimate) various impurity effects in the data for the superconductors, before possible theoretical models for high temperature superconductivity could be tested.

A heatpulse technique for measurements of thermal properties at high temperature with J.R. Olson and R.O. Pohl. We developed a technique which simultaneously measures the specific heat and thermal diffusivity of solids at temperatures between 30 and 300 kelvins. This heatpulse technique is similar to the widely used laser flash technique, but has the advantage of producing accurate values for the thermal conductivity in this difficult measurement regime. We successfully applied this technique to thermal measurements of electrically conducting boron carbides, as well as to other ceramics and glasses.

Specific heats of heavy fermion compounds with E.T. Swartz, B.A. Jones and J.W. Wilkins. We measured the low temperature electronic specific heats of the heavy electron compounds $CeCu_6$ and U_2Zn_{17} using a lattice subtraction method, and determined the entropy of the f electrons from 1.5 to 70 kelvins. We concluded that the entropy of the $CeCu_6$ electrons could be attributed to electronic degrees of freedom due to crystal field splittings, but that the entropy shown by the U_2Zn_{17} compound was too large for such an explanation and required a phenomenological band model.

summer 1983: (Yale Univ., New Haven). Research assistant. Advisor: Prof. Robert Apfel. I conducted experiments with acoustic levitation of oil droplets in water, towards possible applications in tertiary oil recovery.

9/80 – 6/81: (Purdue Univ., West Lafayette). Research assistant. Advisor: Prof. Peter S. Rosen. I developed a computer program (in PASCAL) for an application to neutrino oscillation experiments.

summers 1980–82: (LNL Insurance Corp., Fort Wayne). Computer programmer in research and development of “office automation” systems. Supervisor: James Tunis. Languages: FORTRAN and Basic.

Responsibilities related to Research

<u>THESIS ADVISING/ASSISTANCE</u>

ILL (since 4/04):

- V. Cristiglio (Orléans, France and U. Turin, Italy): structure and dynamics of liquid alloys and liquid oxides studied by neutron and x-ray diffraction using a laser-heated containerless aerodynamic levitation technique. Working with her advisors L. Hennet and G.J. Cuello, I'm giving some instruction to V. Cristiglio in understanding liquids diffraction as well as some assistance with the neutron diffraction experiments and data analysis.

ILL (8/94 – 8/99):

- D.M. Sullivan (U. Bristol, U.K.): critical phenomena in aqueous solutions studied by neutron diffraction.
- A. de Bernabé (CSIC Madrid): simulations of specular and off-specular x-ray diffraction from multilayers.

LURE (10/92 – 7/94):

- H.M. Fischer (U. Nancy), O. Durand (LCR Thomson) and O. Pellegrino (CECM Vitry): experiments and simulations of specular and off-specular x-ray diffraction from multilayers.

McGill (2/90 – 9/92):

- Y. Huai (U. Montréal): data analysis of x-ray reflectivity of multilayers.
- A. Sahnoune (U. McGill) and A. Dawson (U. McGill): experiments at very low temperature.

Cornell (9/84 – 1/90):

- J.R. Olson (U. Cornell) and A.P. Horsfield (U. Cornell): measurements and analysis of thermal properties at low temperature.

<u>PRINCIPAL RESPONSIBILITIES AT ILL</u>

(since 4/04): Responsible of the D20 instrument, a variable resolution high-flux diffractometer used for powder diffraction and some liquids and glasses diffraction. I'm taking charge of the radial oscillating collimator project for D20, which has already successfully passed the prototype stage.

(8/94 – 8/99): Sole responsible of the D4 instrument, a diffractometer for liquids and amorphous materials (on average, I performed about 30 experiments per year at D4 and other ILL instruments).

(5/95 – 8/99): Head of the D4c project, involving the design, fabrication and installation of a new "microstrip" detector system for the D4 neutron diffractometer. Apart from the scientific and technical aspects of the D4c instrument, I was responsible for the budget of 500 000 euros (3.3 MF) and the management of the efforts of about 15 people related to the project.

(10/96 – 9/00): Local thesis advisor for D.M. Sullivan (Univ. Bristol).

Teaching Experience

TEACHING EXPERIENCE AT UNIVERSITÉ PARIS-SUD (PARIS-XI)

year 02/03: Same duties as in 01/02, being 184 hrs éq. TD in total.

year 01/02: Lectures, recitations and lab practicals in cristallography/diffraction (4th-year honors physics) (C: 22.5 hrs, TD: 22.5 hrs, TP: 48 hrs); Physics lectures for 1st- and 2nd-year medicine (PCEM) – the same duties and responsibilities as in 2000/01 (C: 58 hrs); Tutor for a thesis student (éq. TD: 5 hrs).

spring 01: Lectures and recitations in mechanics for 3rd-year Physical Sciences (C: 9 hrs, TD: 14 hrs); Physics lab practicals for 3rd-year electronics (EEA) (TP: 38.5 hrs); Tutor for a thesis student (éq. TD: 5 hrs).

autumn 00: Physics lectures for 1st- and 2nd-year medicine (PCEM) (C: 58 hrs) – mechanics, hydrodynamics and waves – as responsible for the physics teaching of 440 students in PCEM, my duties include coordination of a team of 8 teaching assistants (maîtres de conférence) for the recitations, composition of exams, budget overseeing (for lab practicals, etc), and participating in inter-disciplinary meetings concerning pedagogy and exams; Physics lab practicals for 3rd-year electronics (EEA) (TP: 24.5 hrs).

spring 00: Lectures and recitations in mechanics for 3rd-year Physical Sciences (C: 9 hrs, TD: 14 hrs); Physics lab practicals for 3rd-year electronics (EEA) (TP: 38.5 hrs).

autumn 99: Physics recitations for 1st- and 2nd-year medicine (PCEM) (TD: 72 hrs); Physics lab practicals for 3rd-year electronics (EEA) (TP: 24.5 hrs).

TEACHING EXPERIENCE BEFORE BECOMING PROFESSOR

spring 95,96,97,98,99,05: HERCULES instructor: Lectures and recitations on neutron diffraction from liquids and amorphous solids (C: 18 hrs, TD: 18 hrs).

1/94 to 5/94: Laboratory instructor at Université Paris-Sud, Orsay: Lab practicals in crystallography and the physics of X-rays for about 25 physics students (3rd- and 4th-year) (C: 4 hrs, TP: 56 hrs). *The course was conducted in French.*

1/92 to 5/92: Lecturer at McGill Univ., Montréal, PQ, Canada: Lectures and recitations in electromagnetism for 200 1st-year students (C: 39 hrs, TD: 13 hrs).

1/91 to 5/91: Lecturer at McGill Univ., Montréal, PQ, Canada: Lectures and lab practicals in optics and electromagnetism for 150 2nd-year students. In addition to a volontary reworking of exams, the course curriculum, laboratory experiments and lecture demonstrations, I provided supplementary lectures on error analysis (C: 43 hrs, TD: 13 hrs, TP: 10 hrs).

1/86 to 6/86: Teaching assistant at Cornell Univ., Ithaca, NY, USA: Recitations and lab practicals in electromagnetism and wave mechanics for about 25 2nd-year "honors" students (C: 2 hrs, TD: 30 hrs, TP: 28 hrs).

9/82 to 5/83: Teaching assistant at Purdue Univ., West Lafayette, IN, USA: Recitations and mini-lectures in fundamental physics for about 25 1st-year students, mostly individual instruction (C: 15 hrs, TD: 150 hrs, TP: 15 hrs).

Community Activities

(5 Feb 2004): Rapporteur sur le jury d'habilitation à diriger les recherches (HDR) de Denis Morineau, soutenue à l'Université de Rennes I. Domaine de recherche: Physico-Chimie de la matière condensée, systèmes moléculaires confinés et aux interfaces, milieux désordonnés, études expérimentales et par simulation moléculaire.

(8 Apr 2004): Rapporteur sur le jury de thèse de doctorat de Stéphane Longelin, defended at U. Lille and entitled: "Etude de fluides supercritiques simples (CO_2, C_2D_6) par diffusion de neutrons, spectroscopie Raman et simulation de dynamique moléculaire."

(1 Oct 2004): Rapporteur sur le jury de thèse de doctorat de Fabrice Cavillon, defended at U. Lille and entitled: "Caractérisation de la liaison hydrogène dans des systèmes moléculaires d'intérêt biologique par diffusion de neutrons."

(since 4/04): Expert/Specialist of the ILL's College 6 Subcommittee (Structure and Dynamics of Liquids and Glasses). I'm responsible for giving advice before the subcommittee on the feasibility of neutron beamtime proposals in the scientific area covered by College 6. I also contributed to the "tuning" of the Electronic Proposal Review system.

(1/02 – 12/03): Member of the ILL's College 6 Subcommittee (Structure and Dynamics of Liquids and Glasses), meeting twice per year. I'm a very active member in the process of judging the scientific merits of beamtime proposals. The Institut Laue-Langevin (Grenoble) operates the world's most intense neutron source for external scientific users.

(5/01 – 9/03): Proposer and principal scientific organiser/editor of the neutron scattering school "Structure et Dynamique des Systèmes Désordonnés" taking place from 26 to 29 May 2002 under the aegis of the Société Française de la Neutronique (SFN).

(15 June 2001): External expert on the PhD thesis panel of Cédric Pitteloud, defended at U. Lausanne and entitled "Structure de l'eau inter-lamellaire dans le Wyoming montmorillonite étudiée par diffraction des neutrons avec substitution isotopique."

(6 April 2001): Chairman of the "Molecular Systems" séance during the ILL's Millennium Symposium.

(since 4/01): Elected "titulaire" member of the Commission des Spécialistes (CSE, collège A) of the 28th CNU section at Université Paris-Sud (Orsay).

(11/97 – 6/01): Member of ISIS's Scheduling Panel No. 2 (Liquids and Amorphous), meeting twice per year (I was chairman in December 1999). The ISIS Facility (U.K.) operates a neutron spallation source for external scientific users.

(7/98 – 6/99): Expert/Specialist of the ILL's College 6 Subcommittee (Structure and Dynamics of Liquids and Glasses).

(5/96 – 7/99): Scientific representative for the ESRF/ILL library committee. As one of the 3 ILL representatives, I was able to act effectively concerning the library's budget allocations.

(7/95 – 6/96): College 6 secretary at the ILL. My duties included preparation for the subcommittee meetings, the categorisation of beamtime proposals, the editing of part of the ILL Annual Report, and the organisation of College 6 seminars.

Other Experience

INSTRUMENTATION

Presently at the ILL I'm taking charge of the Radial Oscillating Collimator (ROC) project at the D20 instrument, involving the design, mechanics, motorisation and control of the ROC. The project has already successfully passed the prototype stage and will soon be available for user experiments.

From 5/95 to 8/99 at the ILL, I was the head of the D4c instrument project (budget: 500 000 euros, number of people: about 15), which involved the development of new "microstrip" detectors for the D4 neutron diffractometer. The D4c prototype detector underwent in early 1998 an extensive and very successful series of tests of its neutron shielding, collimation and detector stability, the latter measured to be $2 \cdot 10^{-4}$ over 3 days. In May/June 2000, the final tests and commissioning of the new instrument confirmed that D4c is now the most accurate neutron diffractometer in the world for liquids and glasses. I continue to oversee some aspects of the development of D4c.

Improvement and characterisation of a synchrotron beamline (LURE, 1992-94) and use of synchrotrons of 2nd (NSLS Brookhaven, 1990-92) and 3rd (ESRF) generation.

Repair and automatisation (*e.g.* temperature control) of ^{4}He cryostats and ^{3}He/^{4}He dilution refrigerators (Cornell Univ., 1985-89; Univ. McGill, 1990-91).

FOREIGN LANGUAGES

French: Living and working in France since Oct 92
Certificate of competence (McGill University, Montréal, Canada)
for 6 semesters college study (1990–91)

German: 2 semesters college study at Université Paris-Sud, Orsay (2003–04)
2 semesters college study at Cornell University, Ithaca, NY (1988–89)

Russian: 1 semester at the Institut Laue-Langevin, Grenoble (1997)
6 weeks college study in Moscow (summer 1984)
Certificate of proficiency (Purdue University, West Lafayette, IN)
for 7 semesters college study (1981–84)

Spanish: 10 semesters high school study (1975–80)

ACADEMIC DISTINCTIONS DURING UNIVERSITY STUDIES

Cornell University (1984–1989)

Office of Naval Research (ONR) Graduate Fellowship (1984–1987)

Purdue University (1980–1984)

Dobro Slovo (National Slavic Honor Society) (spring 1984)
Score of 9/120 (median was 0) in the 1983 USA Putnam Math Competition
Golden Key National Honor Society Scholarship (autumn 1983)
Phi Beta Kappa (spring 1983)
Phi Kappa Phi (spring 1983)
Purdue President's Honor Award (autumn 1980)