Post-Doctoral Opportunity in Accelerator Physics at Fermilab

This position is for an initial period of up to three (3) years with the potential for extension.

Fermi National Accelerator Laboratory seeks a highly qualified candidate for a postdoctoral Research Associate position in its Accelerator Division’s IOTA/NDSS Department to work on the theoretical Advanced Accelerator R&D program with the focus on the development of novel concepts for future linear frontier accelerators. The successful candidate will be expected to work in a comprehensive research environment and to help develop new concepts as an essential component of a potential future multi-MW facility to advance neutrino science. The range of activities will also include modeling of beam dynamic effects, evaluation of technical aspects, interpretation and scientific publication of results. Respect, understanding, and value individual differences that embody the principles of diversity. Serve by environmental, safety, and health regulations.

Qualifications and Essential Job Functions
- Ph.D. or an equivalent degree in Physics, Accelerator Physics or related fields by the time of the appointment
- Strong record of recent accomplishments in physics
- Excellent oral and written communication skills (as demonstrated by presentations or conference and poster presentations in peer-reviewed journals)

Application Instructions
Interested candidates should submit:
1) a cover letter including a brief statement of research interests and a curriculum vitae with a list of selected publications. Online application: https://fermi.hodesiq.com/apply_online_1.asp?jobid=4996444

The application deadline is May 31, 2015.

For general information about this position, please contact
Dr. Alexander Yahler at yahler@fnal.gov

There is no legal requirement that Fermilab sponsor an employee for U.S. permanent residence. As a result, Fermilab will make the decision to sponsor an employee on a case-by-case basis. Fermilab will consider the following factors, among others, when determining whether to sponsor an employee for U.S. permanent residence: performance, length of service, long-term need for the position, and cost.

Diverse People, Diverse Jobs
Fermilab is an Equal-Opportunity Employer.

We are looking for a highly qualified:
Head of Division and Project Manager

For more details, have a look at:
http://www.fermilab.gov/jobs/dhd/110

The Courier, April 2015

Thinking the Future.

RESEARCH ASSISTANT / ASSOCIATE
In Experimental and Theoretical Particle/ Astrophysics Research Training Group (GRADUIERTEKOLLEG) PARTICLE AND ASTROPARTICLE PHYSICS IN THE LIGHT OF LHC

OUR PROFILE
The research goal of the DFG graduate school “Particle and Astroparticle Physics in the Light of LHC” is to explore the limits of the standard model of particle physics in the era of new data from major experiments in particle and astroparticle physics. Our experimental research groups participate in the CMS and LHCb experiments at the LHC. In the AMS experiment on the ISS, in the Pierre Auger Observatory in Argentina, in the IceCube Neutrino Observatory at the South Pole, and in various neutrino physics experiments. Theoretical research focuses on electroweak symmetry breaking, physics beyond the standard model, top quark and flavour physics, dark matter and cosmology.

YOUR PROFILE
You have received an excellent university degree (master or equivalent) in particle physics, astroparticle physics or cosmology. We expect strong commitment to teamwork, excellent communication skills, and high flexibility. Please apply with a curriculum vitae, a one-page summary of your thesis, two letters of reference, and a one-page description of your research interests within the framework of the graduate school. Selection will be based on competitive evaluation. Preference will be given to those candidates whose research interests combine two of the aforementioned scientific areas.

YOUR DUTIES AND RESPONSIBILITIES
You will work in close collaboration with your advisor(s) on the scientific goals of this graduate school. You will participate in the school’s training programs (e.g., seminars, special lectures, etc.), and present your work at our annual workshops.

OUR OFFER
The position is of two years with a possible prolongation of 12 months and to be filled as soon as possible. This is a part-time position (75% of the standard weeks for full-time employees). The successful candidate has the opportunity to pursue a doctoral degree. The salary corresponds to TV-L E13 of the German public service scale (TV). RWTH Aachen University is certified as a “Family-Friendly University.” We particularly welcome and encourage applications from women, disabled persons and ethnic minority groups, recognizing they are underrepresented across RWTH Aachen University. The fairness and open competition in applying and appointments will be made on merit.

YOUR CONTACT PERSON
For further details, please contact:
Prof. Dr. Stefan Schael
Tel.: +49 (0) 241-80-27157
Fax: +49 (0) 241-80-25911
Email: Stefan.Schael@physik.rwth-aachen.de

For further information, please visit our website at:
www.fermilab.gov/jobs/dhd/110

Send your application by April 30, 2015 to

Prof. Dr. Stefan Schael
Physikalisches Institut B
RWTH Aachen
D-52056 Aachen, Germany

CERN Courier April 2015

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Quantum Field Theory for the Gifted Amateur

By Tom Lancaster and Stephen J. Blundell

Oxford University Press
Hardback: £19.99 $29.95
Paperback: £12.99 $19.95
Also available as e-book, and at the CERN bookshop

Gauge Theories of the Strong, Weak, and Electromagnetic Interactions (2nd edition)

By Chris Quigg
Princeton University Press
Hardback: £32.00 $75.00
Also available as e-book, and at the CERN bookshop

Many readers of CERN Courier will already have several introductions to quantum field theory (QFT) on their shelves. Indeed, it might seem that another book on this topic has missed its century – but that is not quite true. Tom Lancaster and Stephen Blundell offer a response to a frequently posed question: What should I read and study to learn QFT? Before this text it was impossible to name a contemporary book suitable for self-study, where there is regular interaction with an advisor but no classroom-style. Now, in this book I find a treasury of contemporary material presented concisely and lucidly in a format that I can recommend for independent study.

Quantum Field Theory for the Gifted Amateur is in my opinion a good investment, although of course one cannot squeeze all of QFT into 500 pages. Specifically, this is not a book about strong interactions: QCD is not in the book, not a word. Reading page 808 at the end of subsection 34.4 one might expect that some aspects of quarks and asymptotic freedom were presented in chapter 46, but they do not. I found the word “quark” once – on page 368 – but as far as I can tell, “gluon” does not make its way at all into the part on “Some applications from the world of particle physics.”

If you are a curious amateur and hear about, for example, “Majorana” (p444f) or perhaps “vacuum instability” (p807f), don’t confuse “nicely-chiral” (p320f) or “coherent states” (p446f), you can start self-study of these topics by reading these pages. However, it’s a little odd that although important current content is set up, it is not always followed with a full explanation. In these examples, oscillation into a different flavoured is given just one phrase, on p4-9. Some interesting topics – such as “coherent states” – are described in depth, but others central to QFT merit more words.

For example, figure 41.6 is presented in the margin to explain how QED vacuum polarization works, illustrating equations 41.18-20. The figure gives the impression that the QED vacuum-polarization effect decreases the Coulomb–Maxwell potential strength, while the equations and subsequent discussion correctly show that the observed vacuum-polarization effect in atoms adds attraction to electron binding. The reader should be given an explanation of the subtle point that reconciles the intuitive impression from the figure with the equations. Despite these issues, I believe that this volume offers an attractive, new “rock and roll” approach, filling a large void in the spectrum of QFT books, so my strong positive recommendation stands. The question that the reader of these lines will now have in mind is how to mitigate the absence of some material.

The answer lies in the second edition of Chris Quigg’s Gauge Theories of the Strong, Weak, and Electromagnetic Interactions. By a remarkable coincidence, this essentially revised volume fills in much of what the “gifted amateur” wants to know about how QFT is applied in traditional particle physics. It is hard to find words to describe Quigg’s clear, high-quality work; as an author he is a virtuoso performer. He takes the reader through the Standard Model of particle physics to the first steps beyond it, showing the most important insights, describing open questions and proposing original literature and further reading. He has designed or collected many insightful figures that illustrate beautifully the intriguing properties of the Standard Model. However, it’s hard for me personally to end this review on this high note since the research in the field of gauge theories of strong interactions does not end with the perturbative processes. Over the past 30 years, a vast new area has opened up with many fundamental insights. These connect to the QCD vacuum structure, the Hagedorn temperature and colour deconfinement as encapsulated in the new buzzword – quark–gluon plasma, the strongly-interacting colour-charged many-body state of quarks and gluons. Moreover, there is now a wealth of numerical lattice results that accompany these developments.

I find no key word for this in the index of Quigg’s book, although there is mention of “confinement” (p336f). On page 340, a phrase-long summary mentions the temperature of a chiral-symmetry-restoring transition (from what to what is not stated) that characterizes the lattice QCD results seen in figure 8.47 on p342. This one-phrase entry is all that describes in my estimate 20% of the experimental work at CERN of the past 25 years, and the majority of particle physics at Brookhaven for the past 15 years. In this section I also read how vacuum dielectric properties relate to confinement. I know this argument from Kenneth Wilson, as refined and elaborated by on TD Lee, and the lattice-QCD work initiated by Michael Creutz at Brookhaven, yet Quigg attributes this to an Abelian-interaction model that I did not think functioned.

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The author, renowned for his work addressing two-particle interactions, represents in his book the traditional particle-physics programme as continued today at Fermilab, where the novel aspect of QCD many-body physics is not on the research menu, though it has come of age at CERN and Brookhaven. One can argue that this new science is not “particle physics” – but it is definitely part of “gauged theories, strong interactions”, words embedded in the title of Quigg’s book. Thus, quark–gluon plasma, vacuum structure and confinement glare brightly by their absence in this volume. Looking again at both books it is remarkable how complementary they are for a CERN Courier reader. These are two excellent texts and together they cover most of modern QFT and its application in particle physics in 1000 pages at an affordable cost. I strongly recommend both, in fact as a set. As noted, however, the reader who purchases these two volumes may need a third one covering the new physics of deconfinement, QCD vacuum and thermal quarks and gluons – the quark–gluon plasma.

Johann Ratcliffe, University of Arizona

**Books received**

*Neutrinos in High Energy and Astroparticle Physics* by José Vicente Valle and Jorge Romo

Wiley-VCH

Paperback: £75 •

Wiley-VCH

Also available at the CERN bookshop

This book is a well-written and encyclopedic. Another strong point is its remarkable how complementary they are for a CERN Courier reader. These are two excellent texts and together they cover most of modern QFT and its application in particle physics in 1000 pages at an affordable cost. I strongly recommend both, in fact as a set. As noted, however, the reader who purchases these two volumes may need a third one covering the new physics of deconfinement, QCD vacuum and thermal quarks and gluons – the quark–gluon plasma.

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