

# Netværk for kvinder i fysik

Nyhedsbrev nr. 30

Maj 2002

## Kære netværksmedlemmer!

Nyhedsbrevet bringer det endegyldige program for KIF's årsmøde, samt dagsordenen for generalforsamlingen på mødet den 1. juni 2001. Mødet, som sædvanen tro, afholdes på Hotel Nyborg strand har i år flyttet ugedag til lørdag. Det blev ved sidste års generalforsamling besluttet at skubbe mødet fra hverdag til weekend, så fysikere ansat andre steder end lige netop på Universitet har mulighed for at deltage. Dermed endnu engang et opråb til alle kvindelige fysikere også dem der arbejder på landets gymnasier at deltage i årsmødet. På generalforsamlingen skal det blandt andet tages til revision om placeringen af årsmødet på en lørdag er hensigtsmæssig.

Kirstine Berg-Sørensen har skrevet et referat fra debataftenen der blev afholdt i Rockefeller Komplexet den 15. april. Nyhedsbrevet indeholder yderligere det oplæg der fremkom på baggrund af mødet.

Udklippene er denne gang taget fra Physics World Vol. 15, nr. 3 2002. Temaet for dette nummer er Kvinder i fysik.

Nyhedsbrevet afsluttes med en enkel konferenceindkaldelse samt nogle forskellige links vedrørende Kvinder i videnskab.

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## KIF årsmøde lørdag den 1. juni 2002 på Hotel Nyborg Strand



### Program:

- 10:15-10:30 Velkomst
- 10:30-11:15 Trine Møgelberg  
Fra ene kvinde til hønsegård  
10 års jubilæum for grundlæggelsen af netværket for Kvinder i Fysik.
- 11:15-11:30 Birgitta Nordstrøm  
Referat og diskussionsoplæg i forbindelse med konferensen:  
Working Meeting to discuss steps to be taken in setting up a European  
Platform of Women Scientist.
- 11:30-12:00 Diskussion
- 12:00-13:00 Frokost
- 13:00-13:45 Karin Andersen  
Integrerede optiske komponenter og materialer
- 13:45-14:45 Poster session med kaffe, te og frugt
- 14:45-15:45 Tina Christensen  
Elektron-nedbør
- 15:45-16:45 Jytte Bang, lektor Psykologisk institut (KU)  
Læring i skolen - nogle kontroverser set fra et psykologisk perspektiv
- 16:45-18:00 General forsamling

## **Abstracts:**

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### **Fra ene kvinde til hønsegård**

**Trine E. Møgelberg**

Novo Nordisk

Netværk for kvinder i fysik blev dannet for 10 år siden, hvor det ikke var stuerent at påpege, at køn spiller en rolle for ens karrieremuligheder i de såkaldte eksakte videnskaber. Jeg var med til at stifte netværk for kvinder i fysik for 10 år siden fordi jeg trængte til at møde andre kvindelige fysikere og vil i mit foredrag se tilbage på historien bag dannelsen af netværket. I dag er jeg ansat som kemiker i Novo Nordisk og anden del af mit foredrag vil fortælle om mødet med en anden kultur nemlig det private erhvervsliv. Jeg vil fortælle om mine oplevelser med at arbejde i en afdeling domineret af kvinder, mødet med gode og dårlige kvindelige chefer, om stress og om karriere med små børn.

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### **Integrerede optiske komponenter og materialer**

**Karin N. Andersen**

COM, Danmarks Tekniske Universitet

I dag er den dominerende metode til fremstilling af optiske komponenter silica på silicium teknologi. Komponenter lavet med denne teknologi er store sammenlignet med integrerede elektroniske komponenter. En måde at reducere størrelsen er ved at øge forskellen i brydningsindeks mellem kernelaget og det omgivende lag. En stor forskel i brydningsindeks betyder at man kan lave bølgeledere med mindre krumningsradius og god optisk transmission. Det vil sige, at mindre bøjningsradier muliggør mere kompakte og komplekse komponenter (så som digitale optiske filtre).

I foredraget vil jeg diskutere fremstilling af optiske komponenter, silica på silicium teknologi og nye højindeksmaterialer.

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## **Elektronnedbør**

### **Tina Christensen**

Danmarks Meteorologiske Institut

Vekselvirkningen mellem solvinden og Jordens magnetosfære giver anledning til nordlysaktivitet og andre rumvejsfænomener. Jeg vil give en indledende introduktion til disse emner og derefter fortælle om den energirige elektronnedbør jeg beskæftiger mig med. Man får information om disse elektroner fra både satellitter og jordbaserede instrumenter bl.a. ved detektion af den røntgenstråling og linieemission der stammer fra vekselvirkning med atmosfæren. Jeg vil også komme ind på hvor disse elektroner kommer fra, og hvorledes de opnår energier på flere keV.

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## **Læring i skolen - nogle kontroverser set fra et psykologisk perspektiv**

### **Jytte Bang**

Institut for Psykologi, Københavns Universitet

Jean Piagets arbejder om barnets og den unges intelligensudvikling har længe stået centralt i den del af psykologien, som beskæftiger sig med intellektuel (kognitiv) udvikling. Imidlertid er Piagets grundforestillinger de senere år blevet udsat for en del kritik, ligesom begrebet om hvad læring 'er' er i rask udvikling. I oplægget vil jeg komme ind på fysik-didaktiske relevanser af disse kontroverser og blandt andet trække på egne studier af læreprocesser i fysik.

## Dagsorden general forsamling d. 1/6-02:

1. Valg af referent og dirigent.
2. Formandens beretning.
3. Forslag til nye KIF initiativer.
4. Næste årsmøde; onsdag vs. lørdag.
5. Nyt blod til bestyrelsen ønskes!
6. Evt.

Hvis du ikke kan komme til årsmødet men har en holdning til hvorvidt næste årsmøde helst skal ligge på en onsdag eller en lørdag så fortæl meget gerne en af bestyrelsesmedlemmerne eller et KIF medlem der kommer til dette årsmøde om din holdning.



### Togtider:

Tog fra Københavns Hovedbanegård kl. 8.00, ankomst i Nyborg 9.14,  
Tog fra Århus kl. 8.02, ankomst i Nyborg kl. 10.02,  
Tog fra Ålborg kl. 6.31, ankomst i Nyborg kl. 10.02.  
Tog fra Sønderborg kl. 6.30, ankomst i Nyborg kl. 8.00, og afgang kl. 8.00 ankomst i Nyborg kl. 10.30.

Alle deltagere opfordres til at deltage med en poster. Postertilmeldelsen sker samtidig med tilmeldingen til årsmødet. Posterboards er 1.15 m brede og 1.45 m høje, og de er hævet ca. 30-40 cm over gulvet.

Yderligere oplysninger vedr. årsmødet kan fås på DFS hjemmeside. <http://www.nbi.dk/dfs/>



## **Referat fra mødet om KIF's mulige bidrag til debataftenen om "Dansk fysik i 2015"**

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D. 15. april afholdtes et "gå-i byen" møde for KIF's medlemmer, med det formål at diskutere eventuelle tiltag fra KIF's side i forbindelse med et debatmøde ved Dansk Fysisk Selskabs (DFS) årsmøde i Nyborg 30-31/5. Emnet for omtalte debatmøde ved DFS årsmødet er "Dansk fysik i 2015", hvor en række paneldeltagere vil diskutere dansk fysik i 2015 set fra et forskningsmæssigt, et undervisningsmæssigt og et industrielt synspunkt.

Til mødet d. 15. april var fremmødet noget magert idet kun 5 medlemmer havde fundet vejen forbi Rockefeller komplekset; heraf 3 fra universitetsmiljøet, 1 fra sektorforskningen og 1 fra gymnasieverdenen. Vi havde et konstruktivt møde, og blev enige om at skrive en række punkter ned i et "debatskrift", eller inspirationsskrift (trykt på side 8 i nyhedsbrevet), som er blevet udleveret til 3 af paneldeltagerne ved DFS debatmødet. Udover de punkter, som er fremført i debatskriftet, kom samtalen omkring mange andre emner, som er beskrevet i det følgende:

Indimellem kunne det måske tjene til "vores" fordel at forsøge at besvare spørgsmålet fra "djævelens advokat": Kan det ikke være lige meget om der er kvindelige fysikere; bliver fysik som fag bedre, anderledes, mere rigt,... af at der er kvinder der udfører det? Er det argument "nok" at slå på kvindelige værdier som f.eks. bedre arbejdsmiljø – eller er det manglende arbejdsmiljø i stedet en grund til at kvinderne ikke i så høj grad tiltrækkes af fysik (altså, at det er "vores eget" problem)? Gør vi måske i virkeligheden ondt værre ved at bruge den slags argumenter?

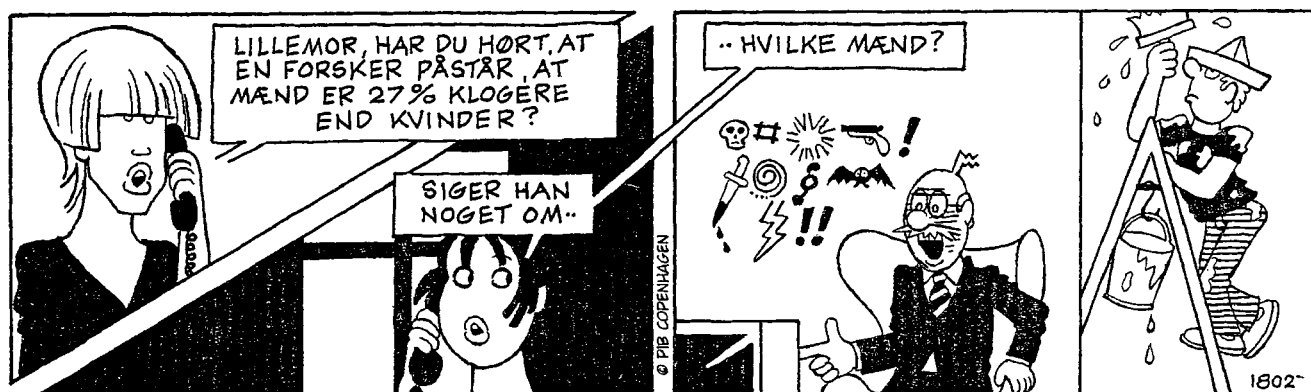
Diskussionen kom også omkring gymnasieverdenen. Det var den fremmødte gymnasielærers erfaring, at pigerne skal "prikkes" for at vælge fysik på højt niveau. Desuden kunne hun fortælle at der i oplæggene til den næste gymnasireform er diskussioner om at droppe liniedelingen, hvorved fysik-kemi risikerer at ryge helt ud af gymnasiet. I et forslag skal det fremtidige gymnasium være opbygget med en basisdel, og naturvidenskab repræsenteres med noget tværfagligt i stil med "naturfag". Endelig kunne hun fortælle at der er talt om rekruttering af gymnasielærere i naturvidenskabelige fag fra Singapore.

Af andre punkter, der kom op under diskussionen kan nævnes muligheden af at indføre "professions-bachelor-grader", som måske kunne øge rekrutteringen til fysik studiet. En anden interessant observation/spørgsmål til videre undersøgelse er om kvinder med børn er utilbøjelige til at søge Ph.d. stipendier, pga. krav om udlandsophold, mens mænd ikke lader børn forhindre dem i at søge Ph.d. stipendium. De mandlige Ph.d. studerende er i alt fald ikke blege for at søge dispensation for kravet om udlandsophold pga. familieforhold, ved de kvindelige studerende at der eksisterer en sådan mulighed? Endelig diskuterede vi om kvindelige studerende i fysik føler problemer med sex-chikane, og om der mangler et organ, hvor man kan gå hen med den slags oplevelser. Det er uklart om det er et generelt problem, men når de kvindelige fysikstuderende allerede på rusturen får at vide at de blot skal iføre sig lårkort for at være sikre på at bestå et navngivet fysikkursus ved Københavns Universitet *er* der måske et generelt problem!

Måske har ovenstående givet nogle KIF medlemmer lyst til at fare i blækhuset. I så tilfælde kan bestyrelsen igen opfordre til at benytte den mailingliste, som Tina har oprettet: [kif@yahooogroups.com](mailto:kif@yahooogroups.com).

Kirstine Berg-Sørensen

## POETEN OG LILLEMOR ved JØRGEN MOGENSEN



## Udspil til mødet på DFS-årsmødet som følge af debat-aftenen

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I forbindelse med debatmødet "Dansk fysik i 2015" ved DFS årsmødet 2002, har en række af Netværk for Kvinder i Fysik (KIF)'s medlemmer diskuteret emner for debatten, som vi mener bør fremføres:

- Skal kønsprofilen på fysik-institutterne ved de danske universiteter i 2015 følge "Århus modellen" med 0 fastansatte kvinder, eller skal andelen af kvindelige fastansatte nærme sig andelen blandt de studerende (inkl. Ph.d.) - nemlig 20 % ?
- Vi mener at flere kvinder i forsknings- og undervisningsmiljøerne vil tiltrække ikke blot flere kvindelige studerende (pga. Rollemodeller) men måske også et bredere spektrum af mandlige studerende, så fysik får et mindre "nørdet" image. Det vil formentlig også forbedre arbejdsmiljøet på institutterne.

I marts i år afholdte The International Union of Pure and Applied Physics (IUPAP) en konference i Paris omhandlende "Kvinder i Fysik". Et af konferencens hoved temaer var det faktum at andelen af kvinder i fysik bliver mindre for hvert trin man tager op ad karriere stigen. I Danmark slår denne tendens først igennem efter Ph.d. niveau, men så slår den også hårdt igennem, hvilket placerer Danmark blandt de lande i Europa der har den laveste andel af kvinder blandt universiteternes fastansatte i fysik. Flere faktorer bidrager til den lave andel af kvinder i fysik. Det faktum at det er kvinder der føder børn og ofte også står for en stor del af børnepasningen (inkl. barselsorlov) nævnes ofte som en årsag. Men at dette ikke kan være den eneste årsag er klart når man tager i betragtning at man, i størstedelen af de lande der har en større andel af fastansatte kvinder i fysik, har langt mindre mulighed og tradition for offentlige børnepasningsordninger end i Danmark. En anden medvirkende årsag kan være at der i div. bedømmelses udvalg og ansættelses komiteer muligvis eksisterer et ubevidst bias mod kvinder. Det er f.eks. dokumenteret at kvinder vurderes strengere end mænd ved fondsansøgninger (Wennerås & Wold, 1997, Nature 347, 341) ved den svenske pendant til Statens Sundhedsvidenskabelige Forskningsråd, ligesom det i en undersøgelse på naturvidenskabeligt fakultet ved MIT (<http://web.mit.edu/newsoffice/nr/2002/genderequity.html>) blev klarlagt at kvindelige ansattes løn- og arbejdsforhold var så meget dårligere end de mandlige kollegers at MIT øjeblikkeligt, og med tilbagevirkende kraft, gav samtlige kvindelige ansatte en klækkelig lønforhøjelse! Generelt mener vi derfor at en større gennemsigtighed i såvel vurderinger fra forskningsråd, vurderinger af ansøgere til stillinger på universiteterne,



og proceduren forud for stillingsopslag kun kan forbedre vilkårene for kvindelige fysikere. Vi kan derfor kun opfordre til

- Brede stillingsopslag frem for stillingsopslag som tydeligt henviser til een bestemt ansøger. Dette er tilsyneladende mest et problem på de "gamle" universiteter; Århus Universitet, Københavns Universitet og DTU.
- Generelle retningslinier, hvor bedømmelsesudvalg tvinges til at tage hensyn til barselsorlov/forældreorlov for såvel fædre som mødre.
- Bevidsthed om potentiel (ubevidst) bias mod kvinder. En sådan ubevidst bias er fundet, som nævnt ovenfor, i undersøgelsen af uddelinger af fondsbevillinger indenfor det sundhedsvidenskabelige område i Sverige (Wennerås & Wold), samt i MIT undersøgelsen.
- En mere synlig ledelse ved universiteterne, og en ledelse, der er efteruddannet til at besidde de lederevner mht. "personalepleje", der i høj grad forventes i erhvervslivet.

Eftersom der i mange år har været en relativ høj andel af kvinder blandt de studerende, mens andelen af fastansatte kvindelige fysikere ikke er blevet højere, mener vi bestemt, der er stof til eftertanke. I Danmark er det tilsyneladende acceptabelt med positiv særbehandling for mandlige pædagoger/pædagogstuderende og mandlige studerende til uddannelsen til social- og sundhedsassistent. Tager man de nævnte påvisninger af, at ubevidst negativ særbehandling af kvinder i den akademiske verden finder sted i en del af de lande vi normalt sammenligner os med, i betragtning, kunne et emne til debat være at spørge om det ville være "forkert" i en periode at have positiv særbehandling for kvindelige fysikere?

På KIF's vegne

Anja C. Andersen

Kirstine Berg-Sørensen

Liv Hornekær


Formand

Næstformand

Bestyrelsesmedlem

## The Committee on the Status of Women in Physics

<http://www.aps.org/educ/cswp/index.html>




AMERICAN PHYSICAL SOCIETY

One Physics Ellipse • College Park, MD 20740-3844 • (301) 209-3200 • [www.aps.org](http://www.aps.org)

The Committee on the Status of Women in Physics (CSWP), an outreach committee of The American Physical Society, was founded in 1972 to address the production, retention, and career development of women physicists. The Committee consists of nine volunteer members appointed by the President of the APS. The CSWP sponsors a number of studies, programs and publications, including:

- Site visits to physics departments to assess the climate for women/minorities in the departments
- Speakers lists of women and minorities in physics
- Travel grants for minority and women speakers
- The *Gazette*, the official newsletter of the CSWP, featuring updates on CSWP activities and programs, book reviews, reports and articles on programs designed to increase the participation of girls and women in science
- WIPHYS, an electronic list serve which reaches several hundred subscribers and serves as a means to exchange advice and discuss issues of interest to women in physics
- The Roster, which lists names and qualifications of over 4000 women and minorities in physics and is widely used by prospective employers to identify women and minority physicists for job openings.
- IBM/APS Research Internship for Undergraduate Women, a summer internship program for undergraduate women in physics and related fields.
- Receptions and networking breakfasts at the APS March and April meetings, as well as invited sessions during which women physicists give technical talks.

For complete information, please visit our web site at <http://www.aps.org/educ/cswp/index.html> or contact Sue Otwell, American Physical Society, One Physics Ellipse, College Park, MD 20740, (301) 209-3231, (301) 209-0865 fax, [otwell@aps.org](mailto:otwell@aps.org)



# Learning lessons from the classroom

Physicists and educationalists have many theories about why so few girls study physics. ... goes back to school and asks female pupils what they really think

Vanessa Bennett, Callie Crook and Kelly Bullock do not mind being the only girls studying A-level physics at Gosford Hill School in Oxford, a mixed comprehensive with 1200 pupils. In fact, the 17 and 18 year olds are rather proud of it. "It makes me feel more of an individual," says Callie. "Most of the other girls in our year are studying English, drama and performing arts." Vanessa agrees: "It makes me feel intelligent."

Although all three have decided against studying physics at university, they recognize that doing physics at school can open the door to a wide range of careers. Vanessa has always wanted to be a doctor, Callie hopes to be a forensic pathologist and Kelly plans to be a sound engineer. Moreover, they all have high praise for their physics teacher, Helen Reynolds, who has "a way of describing things that other teachers would not think of".

So why are there so few girls in their class? "Physics is seen as a thing that boys do," says Callie. Indeed, boys outnumber girls by four to one at A-level in England and Wales – and by ten to one at Gosford Hill. Vanessa has other ideas: "People perceive physics as having a lot of maths in it, which puts both boys and girls off. In fact, our course does not involve that much maths. Teachers have got to get that across to pupils."

## Competitive edge

Physics teaching at Gosford Hill – like many other schools across the UK – has been transformed in the past two years by a new approach to post-16 education that is designed to attract students, like Kelly, who are not studying maths (see *Physics World* October 1999 pp29–32). Kelly admits that some of the maths taught during the physics lessons is complicated, but finds some of the physical concepts more challenging. That said, she gets a kick out of working things out and from doing experiments.

Physics is Vanessa's favourite science subject. "I really enjoy the lessons and all the practical work we do," she enthuses. "We have not done quantum behaviour yet, but I really like that kind of thing because it links to chemistry, maths and computing. And I love the whole idea of cosmology – because Stephen Hawking does it." Indeed, when asked if they could name any living physicists, all the girls at Gosford Hill knew Stephen Hawking from his books, television appearances and his waxwork figure at the London Planetarium.

Open days and conferences run by universities for 16–19 year olds have also given



Switched on – the girls at Gosford Hill School have strong opinions on physics, teaching and physicists.

the girls a valuable insight into physics and physicists. After visiting the materials-science department at Oxford University, Callie decided she would consider "something in materials" if she fails to get the grades needed to study medicine. During the same visit, Kelly discovered that "physicists are just regular people doing really interesting things and they don't wear lab coats".

So do the girls think that they are better at physics than boys, as the exam results in England, Wales and Northern Ireland showed last year? "We're a lot more competitive with the boys in all our classes," says Callie. "There are so many of them that we feel we have something to prove."

## Formative years

Below the age of 16, all schoolchildren in England and Wales take a general course in science, rather than specialist lessons in physics, chemistry and biology. Clearly this is the age when many girls are turned off physics. Nicola Sampson, 15, explains that physics is hard compared with biology and chemistry. She finds radioactivity and atomic physics particularly difficult to grasp because "there is nothing to look at".

Science also has a bad image according to the girls. One reason may be the lack of female role models. "A lot of scientists in the public eye are men," says Amy Baskerville. "Scientific discoveries made by women are not reported in the media." The girls believe that if they knew some women physicists,

then they might be more inclined to study physics. They also find that the boys in their class are all too eager to point out that all the famous scientists are men – even though the girls usually outsmart the boys in lessons.

Moreover, the impression that some of the girls have of male physicists is bad. "Physicists are people who sit around with too much time on their hands," says Stephanie Wiggins. "That's why it breeds so many weird people." But Jennifer Carlaw believes that the media is at fault for stereotyping physicists as men who wear white coats in the lab. "Not to mention having glasses and bad hair," adds Stephanie.

Teacher Helen Reynolds says that Gosford Hill is considering separate science lessons for girls and boys. Stephanie thinks it might be a good idea. "When we do experiments, the boys just mess about," she complains, "they take all the good equipment and muck up everything."

At the end of the day, having a good teacher makes the world of difference. "Physics does not have to be boring," says Emily Field, "it depends how it is taught. If teachers make it more exciting, then it is better. If they just read the lessons from a textbook then you are not going to like it."

## physics

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# How to harness girl power

Parents, single-sex lessons and trendy physicists may help to attract more girls into physics, suggests *Veronica*

Averil Macdonald hit the headlines three years ago when she suggested that physics teachers should be given "flashy cars" to show that physics is a rewarding career. But behind this frivolous comment lay a more serious message: society would value physics more highly if physicists were better rewarded. Macdonald, an educational consultant, believes that girls in particular would respond well to such a message and that it would prompt more of them to study physics at school and university. "Girls are more successful than boys at school in the UK and are quickly learning that they can do anything," she says. "So it is not surprising that they look at society and choose a career that they see as valued."

## Tweed-free and boy-free

Physicists also need to make themselves more attractive to fashion-conscious teenagers. One male physicist, who does not wish to be named, recalls the time his daughter and her classmates went to a lecture by a female colleague. He had hoped that his daughter would be inspired by a female role model, but he was disappointed. "I was so angry when I learned that my daughter and her friends had spent most of the time whispering about the speaker's frumpy clothes and lack of make-up, rather than listening," he says. Many physicists may scoff, but comments like these from schoolgirls cannot – and should not – be swept under the carpet.

Macdonald says that the critical stage for girls is between the ages of 11 and 14, when they become acutely aware of their femininity. She firmly believes that single-sex science lessons are the answer. "Girls *can* do physics and they will dutifully do the work, but they don't engage in it the way that boys do," she explains. "Girls need time to explore things experimentally."

Marcia Barbosa, chair of the International Union of Pure and Applied Physics (IUPAP) working group on women in physics, agrees that the prejudice against girls in some countries is a complex issue. "The way physics is taught at school has largely been



Thinking about physics – schoolgirls attending a course at Bristol University to promote physics as something that women actually do.

developed by men, rather than women," she explains. "Even small changes could make a big difference."

Later this month, some 300 physicists from 65 countries will exchange ideas on physics teaching and social conditioning at the IUPAP Women in Physics conference in Paris. Beverly Hartline, deputy director at the Argonne National Laboratory in the US, is hoping to learn about the innovative approaches being taken in other countries, like France and Italy, which are much more successful than the US at educating girls in physics. Among the resolutions that will be put forward at the conference are co-operative learning at primary school, activities that integrate science and technology with other disciplines, plus physics, maths and computing clubs.

## Untapped potential

Successful approaches to physics teaching appear to emphasize the application of physics to the real world and the opportunities that it provides. Macdonald has found that many careers advisers in schools are badly informed about physics. "Many of them seem to think that you can only become an Einstein or a Hawking if you study physics,"

she explains. "If they do suggest careers with physics, then it is usually engineering."

Although the number of physics graduates in the UK has remained the same – at about 2400 – for over a decade, these students study physics because they find it fascinating. "That is great," says Macdonald, "but they form a core group who will study physics regardless. We need to tap into a much larger market – the students who would go on to study law, for example – and show them that physics is valuable."

Hartline insists that new ideas to generate greater awareness and interest in physics in young girls must also target parents. Macdonald agrees: "At the end of the day, the majority of girls want to feel approved of by their parents." Even though they may not actively discourage their daughters from choosing physics, many mothers talk more favourably about office jobs. Mothers also dislike the idea of their daughters working in what they see as a laboratory full of men. Macdonald claims this attitude arises because parents are not well informed about the working environment. "That's why you find many women physicists have a mother or father who is also a physicist," she explains, "the parents have no fears about their daughter working in the same environment."

So what is the answer? When Macdonald was a physics teacher, 10 years ago, she organized a women-and-daughters day at school. The aim was to reassure mothers that their girls would be fine if they chose to study physics at A-level. The following year, the girls in her A-level class outnumbered the boys for the first time.

But such successful initiatives do not necessarily lead to more women studying physics at university, as Helen Heath, a physicist at Bristol University in the UK, has found. Heath runs a "Think about Physics" course that attracts about 200 14–15-year-old girls into the department every year. One of the aims of the course is to try and improve the perception of physics and promote it as something that women do. The girls undertake practical work, watch demonstrations and talk to women who work in physics and engineering. "Teachers tell us that they have bigger A-level groups," says Heath, "but we are not really seeing an increase in numbers at university level. Although the girls may not do physics themselves, perhaps they won't be too discouraging when their own daughters suggest it."

# The ladies vanish

Many talented women leave physics after receiving their PhDs.

**Peter Rodgers** reports on schemes trying to reverse this trend

Physicists like to believe that every problem has a solution. They also like these solutions to be natural and universal – and sometimes even elegant and beautiful – rather than contrived or ad hoc. But some problems are so difficult that they can only be solved by less than elegant methods. The shortage of women in physics is one such problem.

In an ideal world every other professor of physics would be a woman, rather than fewer than one in ten, as is the case at present. But we do not live in an ideal world and constructive or affirmative measures are needed to ensure that more girls study physics at school and university and, just as important, that more women remain in physics careers after they graduate.

In some countries women account for 20% or more of new PhDs in physics or astronomy, but a “leaky pipeline” means that similar numbers do not go on to become professional physicists or astronomers. Several organizations have now introduced schemes to try to overcome this problem. The best known is probably the Daphne Jackson Trust in the UK (see below), but other schemes are now running in the Netherlands, Sweden and other countries.

## Building bridges

Although the Netherlands may have a reputation for being enlightened and liberal, only about 3% of the physicists in permanent positions at universities or government-funded research labs are women. To remedy this situation, in 1998 the Foundation for Fundamental Research on Matter (FOM), which funds most of the physics research in the Netherlands, set up the FOM/f scheme with a budget of €5m over six years.

The scheme supports female physicists in a variety of ways. Christa Hooijer, the programme officer who runs the scheme for FOM, explains that a physicist must usually spend a few years abroad during their post-doctoral career if they hope to obtain a permanent position in the Netherlands. To facilitate this, FOM provides personal post-doc positions for women: if a woman can obtain funding for a two-year post-doc position from abroad, FOM will fund her for a further three years in the Netherlands.

The FOM/f initiative will also finance a “bridge” if a department cannot fund a permanent position at present, but will be able to do so in the future. So far the scheme has funded six bridges and three personal post-doc positions. The scheme also funds high-quality grant proposals from women that fall just below the financial cut-off in a par-



Strength in numbers – the biannual day for female physicists organized by FOM/f is always popular.

ticular round of applications, small grants for travel and visitors, and the Minerva prize for the best physics paper by a woman based in the Netherlands.

Despite prolonged efforts by the Dutch government to encourage more women to study science at university, the figures have remained at about 12% for almost two decades. “The number of Dutch women graduating in physics is at an abysmal level,” says Hooijer, who obtained a PhD in quantum optics before joining FOM. “I don’t know why so few women enter physics, but I don’t think that physicists can solve this problem on their own by, for example, making physics more attractive to women.”

Hooijer explains that the FOM/f scheme is aimed at the women who chose physics in the first place and is intended to make the postgraduate part of the pipeline less leaky. “There is definitely a role for physicists here because women have entered the physics culture by this stage,” she says. “But other parts of the problem are due to the low participation of women in the workforce, and no amount of making physics more fun is going to change that.”

## Highs and lows in Scandinavia

The Swedish government has been trying to increase the number of female scientists and engineers in its universities for many years. Initially funds were allocated directly to the universities to hire women at the assistant- and full-professor levels but these schemes ran into legal difficulties. Awards are now made by the Swedish Research Council and they go directly to individual women, who are then free to take the funding to the Swedish university or research institute of their choice. The awards last for six years and also include project costs for research.

“The positions are very attractive,” says Kåre Bremer of the Swedish Research Council, “and many of the women who have held these positions have gone on to become full professors in Swedish universities.” The council received 141 applications when it advertised three new positions last year and is currently considering if it should increase the number to five.

Danish women have not been so lucky. Several projects to fund female scientists have been attempted but most have been one-offs, and there is currently just one female physics professor in the country. However, the Network for Women in Physics in Denmark has been running since 1992. One of its aims is to “exchange information on teaching methods that can enhance the interest of girls and young women in physics”. It also organizes seminars and colloquia that are open to the public, and an annual meeting of its members.

“We both find it very encouraging to attend the annual meeting of the network,” two committee members – Eva Danielsen of the Royal Veterinary and Agricultural University and Kirstine Berg-Sorensen of the Niels Bohr Institute – told *Physics World*. “It is a pleasure to meet women who love physics as you yourself do, and to hear them present their research. Many of us work in small groups where we are the only woman working as a physicist.”

While the meeting can be very positive, Danielsen and Berg-Sorensen add that it can be “frustrating to hear the same problems of gender discrimination repeated over and over again, and not always to be able to give suggestions of how to solve them”.

## Breaking down the barriers

The Daphne Jackson Trust was set up in the UK in 1992 to allow female scientists and engineers to return to work after a career break for family reasons. Named after the late Daphne Jackson – who was the only female professor of physics in the UK for many years – the trust offers fellowships that allow women to work part-time for up to two years. It currently funds about 20 fellows in all areas of science and engineering.

Since fellowships are normally only available to those who have taken a career break of three years or more, it is common for women to enter completely new fields after returning to work. This means that suitable retraining is a key part of the programme. Dorothy Duffy, a senior research fellow in condensed matter at University College London, says that this retraining, combined with the ability to work part-time, are the main advantages of the scheme. “It would have been difficult for me to return to science without such a scheme,” says Duffy, “because employers do not readily consider part-timers unless they are already established in a particular field.”

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● [www.daphnejackson.org](http://www.daphnejackson.org)

## Tips for women

### Tips for women

So what advice do these successful women have for aspiring physicists? Deborah Jin believes that is important to realize that physics is challenging and that it is easy to get discouraged. Women, in particular, should strive to remain confident about themselves and in their abilities.

Alice White agrees. "Stick with it," she urges, "the intellectual stimulation you get in the physics community will help you learn and grow your whole life." It is also important, believes Margaret Murnane, for women to understand that some of the negative aspects they encounter are not personal.

"Stand up and speak out" is the advice from Hide Fukuyama, director of the Institute for Solid State Physics at the University of Tokyo. Fukuyama believes that women need to take the lead, "even in tiny things like organizing seminars and parties". She believes that it would be good to systematically encourage such behaviour in women, though it would be "somewhat against the tradition in Japan".

To be successful, claims Helen Quinn, women have to recognize that they must be both capable and assertive without becoming

### Is physics too macho?

"Physics exists in the abstract and is genderless, but the people who do physics might be too macho. Actually, being too macho, though it might often work to your advantage, can also be a liability when it prevents you from acknowledging what you don't know."

— Alice White, Cornell University, US

"I could never think physics is too macho – maybe physicists are too macho."

— Heidi Jurgen, Zürcher University, Germany

"Yes, sometimes there is a very aggressive and unsupportive attitude in UK academia. This is particularly prevalent in maths and physics."

— Helen Quinn, Dartmouth University, USA

"YES. YES. YES."

— Margaret Murnane, MIT, US

ing aggressive or defensive. "You need to know how to stand your ground in a physics argument," she says, "and to accept questions as interest, rather than as a challenge to your work."

### The role of men

While women are leading the battle for equality, men have an important role to play as well. Cesarsky finds that, in general, men

become really interested in these issues when they themselves have intelligent daughters and suddenly realize the problems that their children will encounter.

Alice White at Bell Labs also believes that it is crucial to get support from men. She recalls the time she was at an international physics conference when the keynote speaker – a well-known physicist – began telling offensive sexist jokes to the largely male audience. Afterwards, one of White's colleagues – another senior male physicist – took the speaker to one side and scolded him for his insensitivity. "That really got his attention," says White. "The moral of the story – women can't do it alone."

### Links

- › Women in physics conference (IUPAP)  
[www.if.ufrgs.br/~barbosa/conference.html](http://www.if.ufrgs.br/~barbosa/conference.html)
- › Women and science (EU)  
[www.cordis.lu/improving/women/home.htm](http://www.cordis.lu/improving/women/home.htm)
- › MIT report on the status of women faculty  
[web.mit.edu/fnl/women/women.html](http://web.mit.edu/fnl/women/women.html)
- › Contributions of 20th-century women to physics  
[www.physics.ucla.edu/~cwp/](http://www.physics.ucla.edu/~cwp/)
- › Dual physics career couples  
[www.physics.wm.edu/dualcareer.html](http://www.physics.wm.edu/dualcareer.html)
- › Women in Science, Engineering and Technology (SET) in the UK  
[www.set4women.gov.uk](http://www.set4women.gov.uk)

## Contributions of 20<sup>th</sup> Century Women to Physics



*Hvem er disse kvinder? Kom med forslag på [kif@yahogroups.com](mailto:kif@yahogroups.com)  
Find svaret i næste nyhedsbrev!*

## Konference indkaldelse:

University of Tunis El Manar  
Faculty of Sciences, Department of Physics



### Sixth International Workshop on LASER PHYSICS AND ITS APPLICATIONS

Tunis, Tunisia  
11-17 December 2002

The Department of Physics of the Faculty of Sciences of the University of Tunis El Manar, in collaboration with the African Laser Atomic and Molecular Physics Network (LAM), will organize the Sixth International Workshop on Laser Physics and its Applications. The workshop will be directed by: Z. Ben Lakhdar (University of Tunis El Manar, Tunisia), P.K. Buah-Bassuah (University of Cape Coast, Ghana) and A. Wagué (Université Cheikh Anta Diop de Dakar, Senegal). The Local Organizing Committee is composed of: Z. Ben Lakhdar, N. Chahed, M. Cheikh and M. Zghal. Previous Workshops in this series were held in Senegal (1991), in Zimbabwe (1993), in Ghana (1994), in Sudan (1996), Botswana (1998).

The purpose of the activity is to introduce fundamental phenomenon and new applications of lasers, which can be useful for the knowledge progress of, laser physics, lasers in medicine, environment and telecommunications. Optical scientists, physicians, researchers, engineers and optical industrialists from more than 40 countries are expected to meet to present and discuss the latest scientific and technical development in these areas. The Workshop will include the following topics:

**Fundamentals of Laser Physics and Technology**  
**Laser - Atoms - Molecules**  
**Applications of Lasers in Environmental, Art and Archaeology, Biology, Medicine and Optical Communications**

The aim of the workshop is:

- ◆ To provide a forum for all the participants in laser and optical science;
- ◆ To create the opportunity for researchers involved in laser physics and applications to meet and discuss fundamental and applications of lasers;
- ◆ To share information and facilitate the exchange of experience regarding laser physics and its applications;
- ◆ To reinforce the existing joint research activities and establish new ones;
- ◆ To develop links among Physicists, Physicians and Engineers who work on and/or use lasers.

The activity is open to scientists from all countries. Their home institution should cover travel and subsistence expenses of the participants. However, limited funds are available for some scientists from African countries. The official languages will be English. Participants are strongly encouraged to submit a one-page abstract on topics of the workshop. All contributed papers will be published in the proceedings of the workshop. The deadline for submission of abstracts and/or requests for financial support is **15 July 2002** and should be sent to:

**Prof. Zohra Ben Lakhdar**

Faculté of Sciences de Tunis, Campus Universitaire, Tunis 1060, Tunisie

Telephone No: (216) 71872600 Telefax No: (216) 71885073 E-mail: lam6@hexabyte.tn

**Workshop web page address: <http://www.hexabyte.tn/lam6>**

## APPLICATION FORM

*6th International Workshop on Laser Physics and its Applications, Tunis, Tunisia, 11-17 December 2002*

Surname:..... First

name(s):.....

Date of Birth:..... Sex:.....

Nationality:.....

Institute Address (phone, telefax, e-mail):.....

.....

.....

Address for correspondence (if different from above):.....

.....

.....

Academic qualification:.....

.....

.....

Field of interest:.....

.....

.....

Accompanied by (specify):

.....

Please tick as appropriate:

I can find funds for all the expenses: ☐ I am requesting financial support  
for: half travel ☐ full travel ☐ living expenses ☐

I shall submit a paper: yes ☐ no ☐ I need an entry visa: yes ☐ no ☐

Date:.....

Signature:.....



## News from the EU regarding Women and Science

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### MESSAGE

The Commission has published two calls for tenders in today's Official Journal (OJ S 86 - see web-site <http://ted.eur-op.eu.int/ojs/html/index2.htm>) relating to work in the field of women and science.

One call concerns the provision of support for producing sex-disaggregated statistics and gender sensitive indicators on women and science, within the framework of its actions to promote women in science through the Science and Society Action Plan. The contract will require the development of work on statistics and indicators relating to women in science in the European Union and countries associated to the Framework Programmes. It will involve the collection, verification, editing and storage of statistical data requested by and provided to the European Commission on the topic of women and science, and methodological work on and calculation of indicators. This contract will also cover the analysis and preparation of the women and science data for on-line dissemination, and for publications and articles.

The second call concerns a study, which will identify and survey existing networks of women scientists and other relevant women and science organisations, with a view to producing a comprehensive directory and typology of existing networks. The study will also identify challenges and obstacles and provide recommendations for the setting up of a European Platform of Women Scientists.

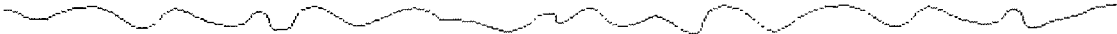
The deadline for submitting tenders in response to these calls is 13 June 2002. Further details can be obtained from:

\*Marge FAUVELLE (statistics and indicators)  
Fax (32-2) 299 37 46  
E-mail: [Marge.Fauvelle@cec.eu.int](mailto:Marge.Fauvelle@cec.eu.int)

\*Tanya LEIGH (networks study)  
Fax (32-2) 299 37 46  
E-mail: [Tanya.Leigh@cec.eu.int](mailto:Tanya.Leigh@cec.eu.int)

Tanya LEIGH  
European Commission  
DG Research  
Unit C5 - Women and Science  
Tel. 32 2 296 46 93  
Women and Science website:  
<http://www.cordis.lu/rt2002/science-society/women.htm>

## Køn og forskning



### Universiteter er kun for mænd

**Kvindernes vej mod en karriere i universitetsverdenen er en ulige kamp, der allerede starter i gymnasierne, skriver dagbladet Urban.**

*Lagt på [www.berlingske.dk](http://www.berlingske.dk) den 22. marts 2002 kl. 02:57.*

Selv om kvinderne siden midten af halvfemserne har udgjort flertallet af de studerende, så lykkedes det kun en meget lille del af kvinderne at blive ansat i faste stillinger på universiteterne.

Et seks år langt, tværvideenskabeligt forskningsprojekt har kortlagt de processer, der udelukker kvinderne fra de videnskabelige stillinger.

- Modsat politikerne i Norge og Sverige så har de danske politikere ikke den holdning, at den manglende ligestilling på universiteterne er et uacceptabelt problem, siger Inge Henningsen, der er statistiker og lektor på Institut for matematiske fag på Københavns Universitet.

Hendes forskning har vist, at kvinderne løbende op gennem hele studieforløbet og frem til professorstillingerne møder en række barrierer.

Af de omkring 700 professorater, der findes i Danmark, er kun otte procent besat af kvinder.

Selv om 60 pct. af gymnasieeleverne er piger, og godt halvdelen af de studerende på universiteterne er kvinder. Men kvinderne får kun 40 pct. af ph.d.-stipendiaterne, og kun 20 pct. af de fastansatte på universiteterne er kvinder.

/Ritzau/

## Links



Title: **Physics needs women**

Location: <http://physicsweb.org/article/world/15/3/1>

Title: **PhDs are worth more for women**

Location: <http://physicsweb.org/article/world/14/9/2>

Title: **Learning lessons from the classroom**

Location: <http://physicsweb.org/article/world/15/3/9>

Title: **Mixing motherhood and science**

Location: <http://physicsweb.org/article/world/15/3/3>

Title: **Turning women into leaders**

Location: <http://physicsweb.org/article/world/15/3/2>

Title: **"TOO LITTLE FOR TOO LONG"**

"Despite 30 years of affirmative action, and contrary to public perceptions, the American faculty profile, especially at pre-eminent Universities, remains largely white and largely male." See <http://www.harvardmagazine.com/on-line/030218.html>

