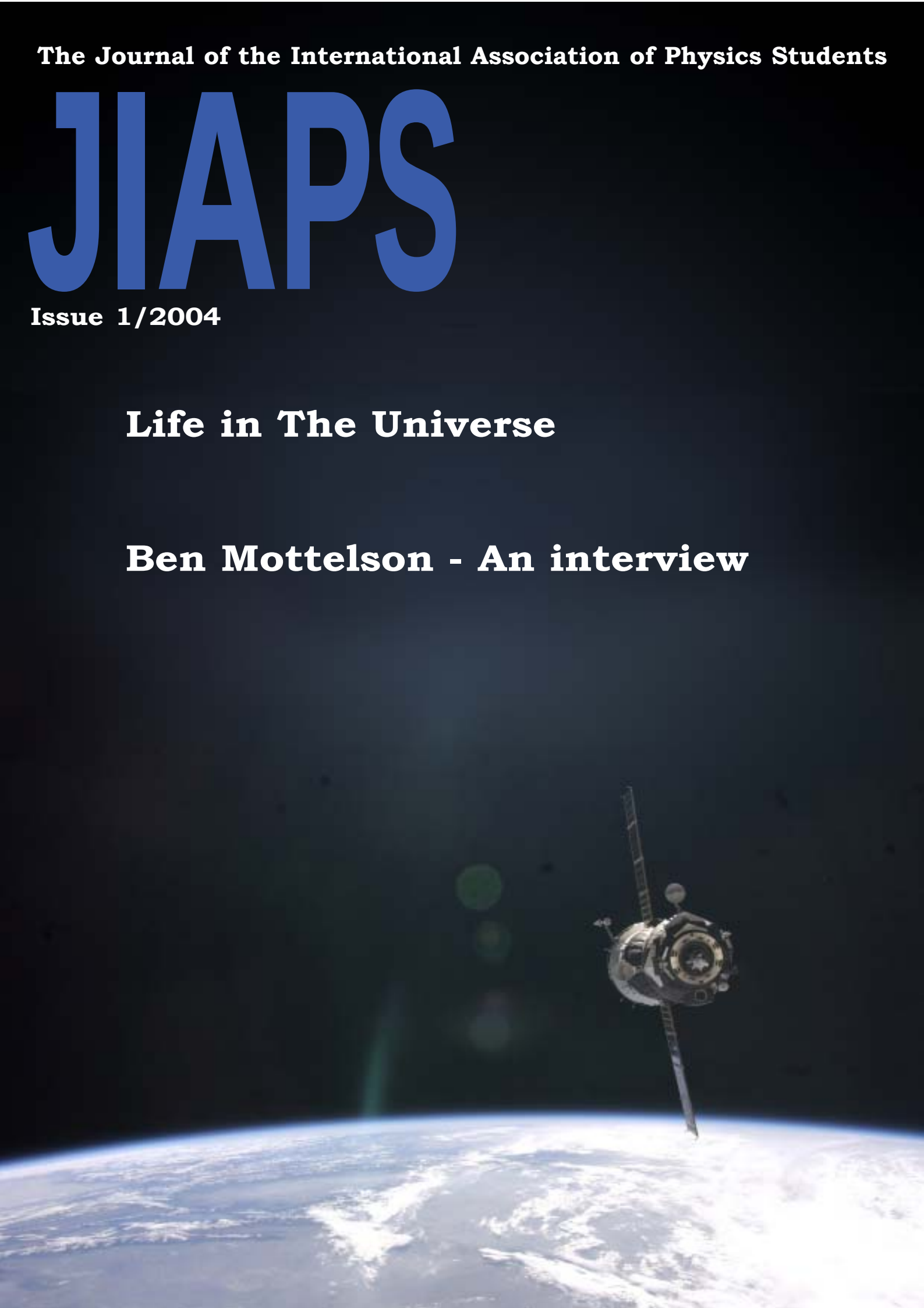
The Journal of the International Association of Physics Students

JIAPS

Issue 1/2004

Life in The Universe

Ben Mottelson - An interview



Finally

You are reading the first issue of JIAPS for the IAPS fiscal year 2003/2004. Finally something concrete. On behalf of the IAPS Central Office (CO) I want to welcome you to enjoy this rarity!

The articles of this issue concider mainly our annual main event, ICPS, arranged in August 2003 in Odense, Denmark. Since then nothing much has happened, at least nothing visible for an ordinary IAPS member. Well, OK, I arrived yesterday from an IAPS Trip to CERN (which was very successfull, by the way, but you'll read more in the next issue :-).

Inspite of this silence and inactivity, so to say, the IAPS executive Committee (EC) and CO have not been resting on their laurels. Hard work has been done e.g. on our website (check <http://www.iaps.info/>!), JIAPS, Trip to CERN, starting cultural exchanges, getting new members, and creating better relations to other relevant organisations. Not to forget ICPS 2004 in Novi Sad. CO, elected by the Annual General Meeting (AGM) in Odense ICPS, is introduced to you in this very issue, in the next issue you will meet other officers.

Still lot of things need to be done before the association is working as it should and could. IAPS is nothing without its members. We are working for Your benefit (and fun). I hope You can feel free to express Your opinions on the success of that work as we need it in order to develop the association for the best of You, fellow IAPS members.

The rest of the year in the administration of IAPS will be spent on strategy process, amendments of the Charter and Regulations and preparing World Year Physics 2005 among other things. Hopefully you will hear more of these at the latest in ICPS.

But now, I don't want to bore you with administration. Hopefully You still want to read the rest of the journal. See you at the latest in ICPS 2004 in Novi Sad!

Milla Karvonen
President of IAPS

Summary

Front page photograph: European Space Agency

JIAPS - The Journal of the International Association of Physics Students

Contact information:
jiaps@iaps.info
IAPS Central Office
c/o Department of Engineering Physics and Mathematics
P.O.Box 2200
FI-02015 Helsinki University of Technology

Head editor:
Tommi Bergman

Editors:
Jyrki Martikainen
Stephan Witoszynskyj
Catherine Gardner
James Drewitt
Hugo Patrício
Victoria Popsueva
Tadeusz K. Orlikowski

Introducing IAPS Central Office from Finland

by Tommi Bergman

ICPS is over and so is the term of Croatian Central Office (CO). In the IAPS annual general meeting three persons from Finland were selected to lead our association through the year until the next ICPS in Novi Sad.

Milla Karvonen was elected as the president and to help her with the managing the association were elected as secretary Paula Kuokkanen and as treasurer Jyrki Martikainen. They have been working for the IAPS CO already through the last year securing a place for an office and funding. Also during the last year improving the flow of information about IAPS activities was often talked about.

With the experience given by the earlier work in different associations in Finland, they will succeed in expanding the awareness of IAPS in the physics students community. But who are the people behind the names? To tell you something about them I asked few questions:

Name:
Milla Karvonen

Place of study:
Helsinki University of Technology

What are your main interests in physics:
Medical physics and biomedical engineering

Why did you want become a physicist:
because of the versatility of possibilities and multidisciplinarity

Do you have physics idols, if you do, who are they?
Professor Olli Ikkala, professor of Molecular Materials from my university, because of realising the idea of multidisciplinarity, because of being so enthusiastically interested in his area of research and because of his ability of sharing the enthusiasm with his students

What are your other interests:
Medicine, biology, biophysics, metrology, digital signal processing, statistics and stochasticity

Do you have any hobbies and what are they:
associations :) singing in a choir, basketball, bicycling

Motto of your life:
Lite bättre. (A little better.)

Name:
Paula Kuokkanen

Place of study:
University of Jyvaskyla, Finland

What are your main interests in physics :
biophysics and medical physics

Why did you want become a physicist:
It seamed easy to learn and stillhard enough to be motivating. Problemsolving is the keyword.

Do you have physics idols, if you do, who are they?
Stephen Hawking, his book 'a brief history of time' inspired me on my teens.

What are your other interests:
good books, poetry, coding

Do you have any hobbies and what are they:
I play violin in the university orchestra and I like swimming.

Motto of your life:
"Curiosity wakes me up in the morning" (said Federico Fellini)

Do you have anything else to tell about yourself:

Name:
Jyrki Martikainen

Place of study:
University of Helsinki

What are your main interests in physics :
Well I'm interested in teaching and enviromental physics

Why did you want become a physicist:
At least in Finland teachers have long vacation, about 3 months per year

Do you have physics idols, if you do, who are they?
Not really, but Albert Einstein a bit because he was a genius and a little bit mad

What are your other interests:

Do you have any hobbies and what are they:
Well I like partying and hiking in wild nature

Motto of your life:
"Elämä on laiffii" which means that life is life ... in a stupid way

Do you have anything else to tell about yourself:
Just ask if you like to know more

The Magic Behind ICPS - A Tribute to the Organizers of All ICPSs

by Stephan Witoszynskyj

You might have already enjoyed participating in an International Conference of Physics Students (ICPS) and it might have been a great experience for you, but many previous ICPS organisers will tell you that the greatest experience of all is to participate in an ICPS after organising one.

Ordinary participants see the surface of an ICPS. They may be satisfied with some things and not so satisfied with others. For them its natural to have a place to stay, have food to eat, listen to lectures, party, and go on excursions etc. But if you have organised an ICPS you know that there is no law of nature that makes those things happen. Suddenly you appreciate that there is something like ICPS at all and that you have the opportunity in taking part in it and not have to worry about all the problems the organisers have to face.

Okay, you might say, why should I worry about the problems of the organisers. Well, there's no need to worry about it, I just want to give you a chance to have a look behind the scenes of ICPS. Of course this view is based on the experiences I had when I was an organiser of ICPS in Vienna. Other organisers may have faced different problems, but I am sure each of them had their share of problems and invested a lot of time and energy to solve them.

The funniest experience, which taught me about the magic that ICPS organisers perform, happened about half a year after I organised ICPS: The city of Vienna invited all people who organised conferences in the city during the previous year to a reception. It was a great event, there was tons of good food and lots of wine to drink. It was very interesting to listen to the conversations of the organisers of all the "professional" conferences, like The European Congress of Radiology or whatever.

It turned out that they had faced many of the same problems that I had. Poor attendance to lectures, visa problems and such like. These conference organisers had much more money and companies that did nothing but organise conferences working for them. ICPS organisers may have to face the problems by themselves, as I did.

So let's start with simple mathematics first. It's a well known fact that an ICPS conference fee is approximately 130 Euro and that an ICPS lasts about seven days. Since the seventh day is the day of departure, let's not count it. By using basic mathematics one can calculate that for each day there are 20.16 Euros. This amount should cover accommodation, meals (typically breakfast and lunch) and all kinds of activities. If you compare this to what hotels typically cost, you will find out that organising an ICPS should not be possible by the laws of finance - and we have not yet talked about the costs of the conference handbook, excursions and thousands of small things that are so easy to forget (e.g.. name tags, postage or cleaning up after parties!). So how in the world can we organize an ICPS? Well, of course one could try to convert some elements to gold by playing around with atomic physics, but I guess the few atoms we might create, would not even cover the costs of building a machine to do so. What else can we think of? Sponsors, maybe. Sponsors are a great idea indeed. Without them an ICPS would not be possible, but it is not always

The biologist says “I study the principles of life.”
The psychologist says “You are controlled by the principles of life.”
The businessman says “My business can use its force to control the economy.”
The economist says “The forces of the economy will control your business.”
The engineer says: “My equations are a model of the universe.”
The physicist says: “The universe is a model of my equations.”
The mathematician says: “I don’t care.”

easy to sell ICPS to sponsors, somehow they always ask what's in it for me if I give some money to physics students? This can make it very hard to find the money necessary to organise an ICPS. So maybe we can find ways to cut costs, ICPS organisers can be very creative when it comes to cutting costs, but it has its drawbacks. One might need more people to help, cut down the time the organisers are allowed to sleep during the conference or make compromises that mean the expectations of some participants are not met (like with food or accommodation). However, for some strange reason, there always a few who expect the luxuries of a five star hotel for 130 Euros a week.

I guess you get an idea of how difficult it is to finance an ICPS, but of course money is not everything. It is just the most obvious example of the problems the organising committee has to solve to make an ICPS possible. Many of the other things are never seen by the participants.

One issue that caused more drama than anticipated was the problem of visas. For some reason the countries of the European Union seem to want to keep residents of some countries out and therefore they require them to get visas, which are hard to get - at least for normal people, it does not seem to be a problem for Mafia bosses, prostitutes and so on to obtain a visa. Without the help of the organising committee nobody can obtain a visa. The organisers need to send out invitations and give guarantees that it will cover all costs that are caused by the person wishing to obtain a visa. Those costs include everything from medical expenses to the costs of extraditing the person. So, sending out the invitations is a risk for the organisers, it's good idea to look for health insurance for the participants at least, otherwise it could quite easy for the organisers to end up bankrupt.

But, as I found out, that's the easy part. It turned out that each embassy required different documents or procedures. Of course there was a standard procedure, but by using that it would have been almost impossible to for anyone to obtain a visa. The embassies adjusted their procedures on the needs of the country they were in. Luckily everybody got their visa, but the worries did not end there...

The conference started and just before the opening ceremony I was told that one participant was stuck at the Austrian-Slovenian border because of a wrong visa. It turned out that an Austrian embassy put a wrong date on the visa and therefore the participant was not allowed to enter Austria. After calling and sending faxes to the embassy in Slovenia and the embassy which issued the visa a few times, the guy was allowed to enter Austria and I was completely exhausted, but of course this was not the only problem...

I still haven't talked about the conference itself, but I probably would not stop if I started. I guess you now have an idea about the enormous job that ICPS organisers do and that was the aim of my article. So let's once again thank the organisers of all ICPSs that have been organised so far and wish the organisers of all future ICPSs good luck. It's hard work, but it is a great experience as well.

More information about ICPS's and other IAPS activities:

http://www.iaps.info/

The National Party, ICPS2003

by Tadeusz K. Orlikowski

What does one write about a party, when trying to avoid mentioning who drank too much alcohol? Names will not be mentioned here. Some people say that other national parties have been better. They were wrong - the party can not be called anything other than a success. The aim of the National Party was to present the nationalities represented at ICPS, and it did certainly gave an insight into the many different countries culture, food and alcohol.

The aforementioned food was served with an incredible variety of drinks. In a short period of time the participants could get a taste of many different countries. Much of the food was interesting, to say

the least, and unfortunately for me there was not enough Scottish haggis to go around. Another small disappointment was that none of the Scandinavians brought rotten fish, still, the Finnish fish-bread was a fascinating experience along with their love for salmiakki in their vodka!

Despite the British abuse of 'Hey Jude' the stage show was nothing short of wonderful. The Scottish-Irish separatist movement stopped the Brits from singing more Beatles songs - I expect the Beatles to be grateful for that and all of the nationalities tried to show what makes them... err... them. The most traditional was perhaps the Greek dancing, the most ironic the Norwegian fighting. Israel presented us with interactive entertainment. I must say that the dancing looked harder then it was and the singing was harder then it seemed.

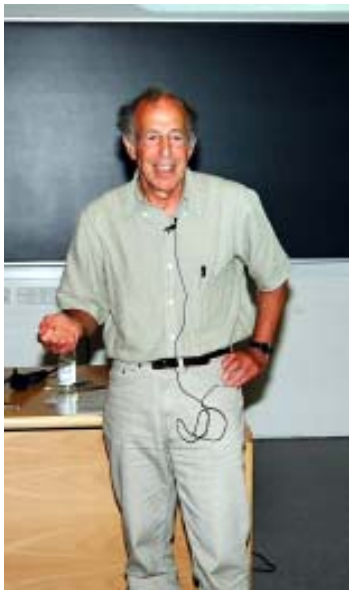
In total the National Party this year was, perhaps, as good as it could get. With a taste of all the participating countries, both on and off stage, and a taste of all the local variations of 40% alcohol... The fact that it continued well into the wee (or small if your not Scottish – Ed) hours of the morning should be argument enough for its success.

Tadeusz K. Orlikowski
Univ. of Oslo

Mr Ben Mottelson Interview at ICPS 2003

by Hugo Patrício and Catherine Gardner

Hugo: Last time we interviewed you. You were working on systems that resemble to nuclei. It was 3 years ago. What have you been doing since?



Ben : I've been spending maybe more than half of my time trying to better understand quantum mechanics, so I'm working together again with my old colleague Aage Bohr and a young colleague of his and what is it really about and were do the equations come from and why do they have these strange forms and it is a very exciting field, we have found some new interesting very different ways to understand it.

Hugo: Nowadays, there are several areas in which Chemistry, Biology and Physics intersect their paths of study and researching. However, do you consider that there are still well-defined frontiers between those sciences, or is that concept of separations doesn't make sense anymore?

Ben: I think that there are different ways to think about matters and it's useful to combine them. Something like these field: The cold Atoms it has involved atomic physics, molecular physics, even nuclear physics can think about it, condensed matter physics, statistical physics, all of these things are necessary and so a person who comes from one area should do something very useful but he needs also to be able to understand the others and to be able to work together with them. So there comes a need for more understanding between fields. But I think people who have learned something from nucliei can really help to understand something that would not be obvious to someone who came from condensed matter physics.

Hugo: Regarding that growing cooperation between sciences, do you think that University Degrees in Physics, Chemistry and Biology should be restructured in order to enhance this interdisciplinarity? Or is it still important that a future scientist specializes first in one of those areas?

Ben: It's a difficult question and I'm inclined to think it is a good idea for Physics people to learn some Physics and then they can learn to talk through biologists, to chemists, to astronomers, but there is a advantage in learning the modes of thought on the kind of connections that are implied in the Physics world but I have to admit that I am uncertain about that. Other people may disagree but I feel that in a institutional situation there are limited amount of time and resources and so on, and there ought to be some kind of focus, and the possibility of making contributions in a broad front should be an important mission but it's something that is made possible by a solid founding in a definite area.

Catherine: There are many European countries at the moment working towards shortening their study time. Do you think that cramming all of the fundamental thought into a 3 years course is detrimental to the developing of Physics as a whole?

Ben: Yes. I think so. I think it takes some time and you should have a space in your life to be able to a Biology lecture if you are interested to or to talk to someone from a completely different area like Economics or something. And having these exams every 3 weeks is not a good way of making people who are expected to be able to think about Physics problems and bring new understanding.

Catherine: Along a similar line. You've got a 3 years course and then a lot of British physics students will join a graduate training in a company. Do you think that is making difficult for academic institutions to keep people in after they have done their first degree?

Ben: I have to admit that I'm not really well versed in institutional issues that involved that because I've had a rather privileged life and been able to do the research that I wanted to and to have contact with young people which has been very stimulating. I can see that there is danger there to the Universities to keep interesting people also. It would be too bad if all the best were immediately attracted to high salaries.

Catherine: And finally. You've mentioned in other interview some years ago that you're looking forward to do some more teaching maybe. And we just wanted to know if you managed to do it? And whether if you are enjoying it?

Ben: I actually teach post-doctoral training course. I will be giving some lectures here in the end of October and I gave similar lectures in a Summer school a few years ago and enjoyed that very much.

Life In The Universe

by James Drewitt

It seems to be the most important question the human race can ask and yet it seems to be the hardest to verify. The question is "Are we alone in space, or put another way, has intelligent life as we understand it evolved elsewhere in the universe?" I have been present during several lectures in my Physics department at Aberystwyth university, a lecture by Sir Patrick Moore also in Aberystwyth and a lecture by Professor Jens Martin Knudsen at this years ICPS in Southern Denmark, in which each attempted to explain the evidence available for life outside the Earth.

"It would be a waste of space if planet Earth were the only one with life" was a comment made by Professor Jens Martin Knudsen. He spoke of an analogy about a huge library of books between the Sun and the Earth. If this library were filled completely with books, then the number of stars visible from the Earth alone would be the sum of all the letters in all these books. There are 200 billion stars in our galaxy the Milky Way. The same number of galaxies are visible from the Earth. When stars are formed in Nebulae, the rotation of the galaxy they are in produces angular momentum in the nebula to throw dust particles outward perpendicular to the axis of rotation. Thus due to the rotation of galaxies, most stars formed in galaxies like our own have their own solar system.

In order for "life like us" to be supported it must be on a solid planet (to enable a gas-liquid-solid interface and thus enhance the exchange between molecules) not too near its star or too far from a heat source, so as to make sure that liquid water is present somewhere on the planet – a necessity for life as we know it. The region of space where a star provides sufficient energy for planetary temperatures to be above the freezing point of water and below the boiling point is called the habitable zone (HZ). However, liquid water may appear beneath ice on planets or moons not in this HZ or possibly in Saline lakes where the freezing point of water would be lowered by some degrees.

To support life, a planet is required to have a stable and low elongated orbit. In this way, the planet remains in the HZ and temperatures don't vary in a way that would be destructive for any life form. A planet is most likely to have a stable orbit if the stellar system it belongs to consists of only one star. However between 50% and 80% of all stars are in binary or multiple systems. Therefore the number of systems (visible from Earth) able to support life is reduced by over half. Another consideration should be the size of the star. If a star is too large, it may complete its main sequence before life has had a chance to evolve on any orbiting planets. Complex life on Earth (animals, plants and fungi) took around 1000Myr to evolve. Therefore any star with habitable planets orbiting it must have a life span greater than 1000Myr. Many of these considerations can be entered as probabilities into a formula entitled the Drake equation and it can be shown that there exists a high probability that complex life could have evolved on many planets throughout the Milky Way and the rest of the universe.

Therefore it is probable that life could be just a step in the order of the Milky Way where protons and neutrons formed the first H and He atoms and then heavier atoms formed into dust and rocks and planets until life is evolved. The question is whether DNA is found only on Earth as a product of a random accident on Earth or whether it is a consequence of the product of a deeply rotted physical law in which case life can always form on habitable planets. It is common for undergraduate Biologists to "create life" in their laboratories mixing the same gasses present in the primordial Earth's atmosphere and introducing electrodes which produce sparks imitating the effect of lightning on these gasses. This is a simple view of the experiment but the actual experiment doesn't get much more complicated. The products of this experiment are hydrocarbons present in amino acids – the building blocks of life.

There are techniques available on Earth where it is possible to detect planets orbiting other stars and even to detect the composition of their atmospheres. The methods involve observing the Doppler shifts of stars when they wobble due to the gravitational pull of an orbiting planet. However

this method is only good for detecting large gas giant planets close to the star. The detection of Earth sized planets; mostly likely to be solid and habitable, at present is only practical using a method known as transit photometry. In this method, the change in magnitude of a star is measured when a planet transits its star (moves in front of it relative to Earth observers). The same method may be used to detect the atmospheric composition of the planet using the absorption spectrum. If the absorption spectrum of a planet corresponds well to that of Earth then life would be likely.

However, no evidence of life outside of Earth can be as good as direct observation. This has become the main impetus of exploration of our own solar system and at present on Mars. There is much evidence that liquid water once existed on Mars but it is unknown how long ago this was. The red dust that completely covers the Martian surface is formed of Iron oxide, which is a precipitate from the oxidisation of the rocks in the presence of liquid water. There are dry riverbeds all over Mars, which can only have been formed by liquid water. Where there was once liquid water, there was once the possibility of life. If it can be verified that life did once exist on Mars, then it is almost certain that it can be found in the present day, elsewhere in the universe.

ALH84001, 0 is a 4.5 billion year old meteorite from Mars that was discovered on Earth. This meteorite has a very special property, which is the strongest evidence so far for life away from Earth. The meteorite contains precipitates of carbonates all over it, in every crack and crevice. Inside the carbonates magnetised Fe_3O_4 has been discovered. Inside some Earth bacterium there exists Monodomain magnetite crystals which when compared to the magnetite taken from the meteorite, the two types of magnetite cannot be distinguished. If this is true, then there is no doubt that there must have once been magnetite bacterium present on Mars.

There are currently several missions to send landers to mars. One of these missions, Beagle 2 led by a British team of Scientists, will be the first lander ever to dig below the Martian surface in a bid to detect evidence for life there. The other landers sent by NASA with cooperation from countries such as Denmark and Germany will host further experiments to detect evidence of life only on the surface of Mars.

It is expected that if Beagle 2 (due to land this Christmas editorditorialcomment:article was written in august) or Athena (due to land early 2004 and 2007) finds evidence for life on Mars, it would still be difficult to convince many people. The solution to this problem would be to send humans to Mars a mission that relies very much upon the success of these landers.

Acknowledgements:

Dr Andrew Breen, Physics Department, University of Wales, Aberystwyth.

Professor Jens Martin Knudsen.

A math student and a physics student are camping.
The physics students takes his turn to do the cooking first.
He makes a tasty stew, but in so doing, uses up all the water.
The next day, it is the math student's turn to do the cooking.
The physics student watches him go to the creek to fetch the water.
He puts the water into the pot and then stops and goes off to do something else.
Puzzled, the physics student asks the math student when he is going to finish making dinner. The math student tells him that there is nothing left to do as now it has been reduced to a problem which has already been solved.

Use of Numerics in Modern Physics -ICPS Presentations.

by Victoria Popsueva

This summer, The International Conference for Physics Students (ICPS) was taking place in Odense, Denmark, 7th -13th of August. The conference was organized by IAPS in cooperation with University of South Denmark.

This was the ˙rst time I participated in an IAPS meeting, as a member of Norwegian delegation, consisting of 18 students from University of Oslo and University of Trondheim. All of us were undergraduate students, and a few (including me) are working on a Master Thesis. I would like to mention some of the impressions from the conference, and especially to comment on some of the presentations made by other ICPS participants.

Everyone will agree that the social events such as The Welcome Party and especially the National Party, which was a great success, help a lot to establish new contacts and just make new friends. However, it is always more difficult to estimate what new physics we have actually learnt - because of our different backgrounds. For my part, I had great pleasure of attending all the guest lectures and student presentations, and would like to mention some of them, which were more or less relevant for my own Master project - or simply interesting.

Numerical Methods,...

In both theoretical and applied physics, very few realistic models can be made to work on performing only “pencil and paper” calculations. Each time we encounter a non-linear differential equation (and it's often!), or a domain with complicated geometry, or a Hamiltonian involving more than two particles - we need to obtain approximate solutions of some sort. Qute a lot of physical problems lead to solving differential equations - and most of them cannot be solved exactly. There exist numerous techniques, and several software packages wich implement those techniques, to be used in industry and research.

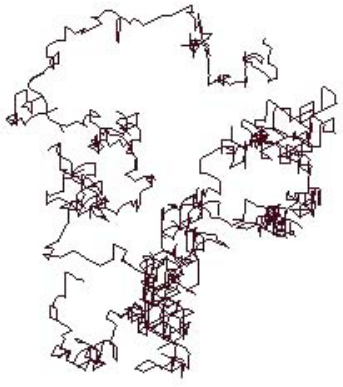
Basically, all the methods work like this: we start with a domain on which we want to solve our equation, divide it into suffciently small grid, wich can have variable sizes, and invent clever schemes to approximate the unknown function and its (partial) derivatives. We can use a well-known Taylor series expansion to approximate the derivative of this unknown function on each gridpoint, and then make the computer to loop through all the points of the domain. This approach is called finite-difference method, and is very well known and widely used. Of course, it's far from a trivial task to make the method work, there are subtle points like grid sizes, covergence, stability and speed of algorithms... This method was brie introduced by Diogo Freitas from University of Coimbra, in his presentation Numerical Methods to Calculate Electric Fields Above a Microstrip Structure. There, he used a commercial !!! package called Maxwell, to solve the Laplace's equation on a domain with mixed boundary conditions. He also showed the pitfalls that are usually encountered in finite difference methods, such as divergence at certain points in the grid resulting in completely wrong numerical values. He also demonstrated that the software could be improved by extending the algorithms to tackle different grid sizes and mixed boundary conditions (present Maxwell algorithms don't do that).

Another popular numerical method is the socalled finite-element method, where we approximate the unknown function by a combination of simpler basis functions (often polynomials), on each little piece of our domain, and then assemble the pieces together. Both methods have their advantages and disadvantages, and can be used in combinations, providing a very powerful tool for solving differential equations on different geometries.

For those who are intersted in learning about numerical algorithms I suggest to take a look at the books:

Introduction to Partial Differential Equations. A computational approach. A.Tveito, R.Winther. and Computational Partial Differential Equations.

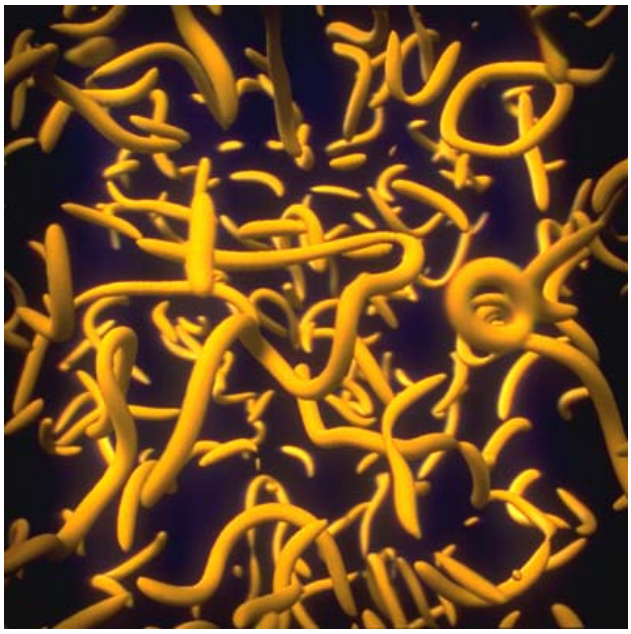
Numerical Methods and Diffpack programming. H.P.Langtangen which vere used in numerics courses at the University of Oslo.



...Monte Carlo Methods...

Another method that is frequently used in numerical experiments is Monte Carlo method, which is basically a model of a statistical process, resembling a random walk, or Brownian motion. In one of its forms,

Monte Carlo algorithm can be used in numerical integration, where we evaluate the integrand at certain points, chosen by a random number generator, with certain probabilities. Monte Carlo method can also be applied to model diffusion processes, as presented in Reaction- Controlled Diffusion by Beth Reid from Virginia Tech, where she investigated a diffusion process of a two-species system. A good introduction to Monte Carlo methods can be found in



Computational Physics. Problem solving with computer. R.H.Landau, M.J.Paez and more applications to quantum systems are found in Monte Carlo Methods in Ab Initio Quantum Chemistry. B.L.Hammond, W.A.Lester,Jr. and P.J.Reynolds

And Strings.

Although I never studied anything related to string theory, I found the Large Versus Small presentation very interesting. Tomislav Terzic made a funny popular presentation of the two competing models for the dimensionality of our space - Kaluza-Klein model and Randall-Sundrum model. The main ideas were presented in a way that even a non-physicist could follow the discussion. Hope to see more articles on the subject in future issues of the IAPS magazine!

Victoria Popsueva, University of Oslo
victoria.popsueva@fys.uio.no
www.fys.uio.no/~vipop

And yet another variation: A Physicist, a computer scientist and a mathematician must calculate whatis 2 + 2.

The physicist constructs out of slopes and balls etcetera a complicatedmeasuring system and finds 3.99998 as solution. “Measuring errors are possible, of course”

The computer scientist writes a 24 page Pascal Program, that spits out 4.000001 as solutions.”Going from a binary to a decimal system and back can cause inaccuracies.

“The mathematician buries himself in his books and writes complicates expressions on thousands pieces of papers. Then he proofs that there is only one solution, and it is calculable.

An engineer, a physicist, and a mathematician are shown a pasture with a herd of sheep, and told to put them inside the smallest possible amount of fence.

The engineer is first. He herds the sheep into a circle and then puts the fence around them, declaring, “A circle will use the least fence for a given area, so this is the best solution.”

The physicist is next. She creates a circular fence of infinite radius around the sheep, and then draws the fence tight around the herd, declaring, “This will give the smallest circular fence around the herd.”

The mathematician is last. After giving the problem a little thought, he puts a small fence around himself and then declares, “I define myself to be on the outside!”

ICPS 2004

Place: Novi Sad, Serbia and Montenegro
Time: 12th to 18th of August
Website: http://www.fizika-ns.org.yu/icps/