IOP Institute of Physics

Engineering Physics Group

Newsletter

February 2007

A Note from your Chair (John Battye)

Following the last AGM (see below) you now have what is substantially a new committee, although at first glance it may not look quite like it.

Things are not as well with the Engineering Physics Group as they might appear. The AGM was organised to co-inside with the Conference, 'Synergy for Success' (see below), to help ensure we achieved a quorum, a thing we have failed to do in the past. In spite of the fact that all the impending vacancies were advertised in the previous Newsletter I was the only one standing for the chair, to which I was unanimously voted in. Samantha Davidson, unavailable for the meeting, was voted in as Acting Honorary Secretary. 'Acting' to let her 'feel the water' as she was completely new to the committee. Victoria, who could also not be present that day, was elected a full committee member. That was it, the meeting closed, no Treasurer.

Fortunately, during the afternoon John Milner who, like many other conference delegates, had sat through the AGM held immediately after the lunch break, had sympathy for those few just elected so offered his services as Treasurer. Since not voted in at the AGM he is for the time being 'acting' in that role. I then co-opted Alison and Roger to help improve transitional continuity and Tom, who though not even a member of our institute has provided valuable assistance to us in the EPG, as a liaison with other institutions to which he does belong. Alison, Roger and Tom are constitutionally unable to stay on the committee beyond this year.

In short if we, the Engineering Physics Group, are to continue we need one or two new committee members, the sooner the better to become acquainted with matters before others have to leave. Also, if we are to have a Newsletter, we need contributions, e.g. articles, from you members. If we don't have a Newsletter our reasons for our existence will become even more questionable. Our continued existence is currently being questioned.

As regards future articles I think it desirable, in at least a first instance, that we have a number of them from different members, outlining the company they work for and its position in the market place. Our information is that your industries and locations are so varied that a good selection should provide quite interesting reading. Articles of a few hundred words would seem to be of a useful length. Otherwise any submissions

on an engineering topic will be seriously considered for our publication. Note that it is probably better that you do not mention your company's name, otherwise you will need to get their written approval of what you have written and send us a copy please. It will also reduce the probability that what we publish will be seen as favouring one company over another, which could give us legal difficulties. We are a charity.

I must point out that we are not looking for highly technical presentations. There are plenty of other publications where I think these will be far more appropriate, and it would be better for you to publish in any case. Overall we have a membership with a very wide range of employment environments and we want to try and provide a little something that will appeal to as many as possible. To that end articles do not have to be on only technical matters. Business, managerial or multicultural matters relating to work in the engineering field are also of interest.

Please make your submissions to me John Battye (john.battye@physics.org)

The AGM

The 2006 AGM was held on 5th October in 76 Portland Place, London. The following changes took place.

Alison McMillan stood down as chair. Roger Hill stood down as Hon. Treasurer. Steven Lawler stood down as Hon. Secretary.

John Battye was voted in as Chair, Victoria Weise as a committee member and Samantha Davidson as Acting Honorary Secretary.

John Milner has been appointed 'Acting Honorary Treasurer'.

Alison McMillan, Roger Hill and Tom Shelley kindly offered there services to continue for a year as co-opted committee members.

Some details are covered in the article, 'A Note from your Chair', above.

The IOP and the Engineering Physics Group (EPG)

A personal view

By John Battye

As ever the Institute of Physics (IOP) is evolving with the aim of better serving its members. Some of the recent changes are 'structural' --- resulting in changes to its organogram --- others financial. Part of the 'structure' includes what is by now a well-established core of specialist and professional groups. To meet developing opportunities and interests new groups are slowly being added, e.g. the Biological Physics Group. Others, that seem to be having more than average difficulty finding viable ways to appropriately serve their members may be dissolved. The Engineering Physics Group (EPG), is seen as being one of the latter. As discussed below the reasons are multifaceted.

As you may know the IOP was formed in 1970 from the 'Physical Society' (PS) (formed 1874) and the 'Institute of Physics' (IoP) (formed in 1920). From their beginnings these two organisations had different slants. The PS was created as a 'society for physical research' (a sort of gentleman's club with a specialised interest), the IoP by Royal Charter of the Government's, 'Board of Trade'. By the time they merged, in 1960, under the name 'The Institute of Physics and the Physical Society' the PS tended to contain mostly academics, the IoP those involved in industry.

With the 1970 formation of the single entity, the IOP, it was hoped that the new combined organisation would be fairly well balanced --- as regards both numbers and managerial influence and direction --- between academia (in which one might include those working on such 'blue sky' government funded projects as CERN and JET) and those in industry, whether nationalised, e.g. the UKAEA power stations, or in private companies, e.g. Hawker Siddeley Aircraft.

As events unfolded the subsequent balance between those in academe and industry became progressively more weighted towards academia. Many reasons might be cited for this but amongst the most significant are perhaps that;

1. British academia expanded during the second half of the twentieth century, whereas British engineering and physical science based industry declined in both absolute and relative terms (vis-à-vis the world).
2. The role of the professional physicist in British industry has declined partly as a result of Britain's changing social structure, partly as a result of their diminishing numbers. The latter has resulted from the progressive weakening of UK industry which has thus had less money to spend on more speculative research, where physicists usually found their initial employment.

3. UK academics find more time to involve themselves in IOP activities since their employer -- in effect the UK Government because the state contributes so much money -- sees its activities as naturally synergic, whereas industrial employers tend not to.
4. As a UK based institution the IoP tends to have UK based members most easily involved in IOP management)

The IOP has of course made efforts to redress this imbalance. Recognising that it's mere size, and hence cost efficiency and influence, put a constraint on its ability to help its members it sought to increase its membership numbers. Since it could not easily find more members within the UK it expanded beyond, particularly into North America. Part of its effort to do this was to instigate a higher profile, more 'upmarket' and more widely appealing magazine, 'Physics World', to replace the earlier monochrome, roughly newsprint quality 'Physics Bulletin'. In another move the IOP, recognising that progressively more of its industrial members were employed under the job title 'engineer' rather than 'physicist', joined the Engineering Council and made it possible for its members to gain Chartered Engineer Status directly via the institute. As such they sought to frustrate the industries 'hard nosed' tendency to offer a financially worse employment package to physicists than engineers merely because the former lacked the backing of such a large, high profile organisation as the Engineering Council. In addition, by keeping its membership fees significantly below those of specific engineering institutions, it also managed to make it financially more attractive for budding Chartered Engineers who originally graduated in physics, to gain their formal status by way of the IOP. An avenue made possible by some of its very successful business ventures, e.g. IOP Publishing. The result of all such efforts was that between 1970 and today membership rose from circa 12,000 to circa 36,000.

If membership numbers are anything to go by we in the Engineering Physics Group (EPG) are fairly successful. With circa 550 members we are the 11th largest amongst the 50 groups of the Institute. However, in terms of getting articles or suggested initiatives from our membership, or getting responses to our questionnaires, or even getting use of some of the facilities the committee has provided, we seem to be struggling.

Initially it was thought we might provide a useful virtual forum for our members to 'network', since we judged our numbers were rather thinly spread throughout industry. To this end we set up a web page where members could outline their speciality for others to seek some advice, should they so desire. This perhaps in something like the same way that employees of large companies, e.g. Shell, can look through their company's organogram to seek advice on any topic the company has specialists in. This was hardly a success. Only 10% of our membership joined and hardly any 'networking' contacts materialised.

We then set up a Bulletin Board (BB) which also attracted almost no attention. Thinking that this may have been because potential users had to be too actively involved, regularly logging onto the BB to see what was displayed, we then offered the facilities of a List Server. This differed from the BB in that queries were broadcasts to the participants as e-mails. In spit of the fact this was introduced in the days when the annoying 'chaff' of the 'junk mail' epidemic was in its infancy the scheme attracted almost no usage.

A more recent successful initiative has been our conference of last October, detailed in the next article. The papers presented were varied and, for the most part, not so specialised as to only find real interest amongst those closely involved in any particular subject. The nature of this seems to have been to the general liking of most of the delegates and perhaps this, to some extent, points one way by which the group may develop its activities.

One of the characteristics of the EPG is the great diversity of its membership's employment environment, not only as regards the type of organisation they work for (which is of course effected by the nationality of its ownership) and their place within it, but also the country in which that company operates. About half of our membership is outside of the UK. In spite of this, it is still perhaps worthwhile broadly typifying our membership as falling into one of a number of categories:

1. Those employed in academia
2. Those in some government (like) agency, e.g. JET, NEL (as it used to be).
3. Those involved in large companies were they are part of a large R&D division, e.g. Shell's KSLA, or Thornton.
4. Those in small companies or companies without too much R&D activity, e.g. companies where they are perhaps one of less than 20 involved in R&D.
5. Those involved in the general activities of a large technically based company, e.g. SIPM, Air Spaciale (Toulouse).
6. Those in some very different line of activity but with an interest in physics and engineering matters, e.g. publishing with a technical slant.

As I guess many of you are aware, if one has ventured into industrial research and development, especially after doing research in university, one soon looks back with an interestingly new perspective. One had learnt at university of the many models that earlier physicists had developed to try and explain the natural world. Each successive one generally gave calculable results closer to those of experiment or at least gave an interesting insight into how to look at the underlying causes of what one observed. Commonly each model sought to be founded on the most fundamental physics known at the time.

In industry the focus was on expediency. One learned that time and manpower was money. One probed as deeply as necessary. If one was designing an aircraft one didn't get preoccupied with finding perfect solutions using the Navier-Stokes equations, one did some wind tunnel tests and got a 'feel' as to how new shapes behaved and tried ones best to quickly confirm the accuracy of 'scaling rules' for the detailed application of interest. The technique might not please the academic purist, but it gave results, and the enormous value of such an approach was evidenced by the fact that even today aircraft are largely designed by refined versions of such an approach. Nor is the technique limited to aerodynamics, there are countless similar examples in other branches of physics, e.g. the ever finer 'microchip'.

In moving into the industrial world one achieved a transition to something like the chemist's approach in studying their discipline; i.e. retain some understanding of the underlying physics but don't get overly 'hung up' on ensuring there is a tight link with it when developing your own project. Time and others, with different priorities, will eventually 'close' the gap. You moved beyond that heavily theoretically loaded, inevitably rather detached; research to focus on making something practical. You learned how to integrate all you --- and you're similarly back grounded new colleagues --- learnt before, to produce a product. Some of you may still be mesmerised by the wonders of physics for its own sake, or perhaps physics without too much 'pollution' by the 'hard' engineering realities. Realities not only of a different approach as outlined above, but likely such constraints as imposed by engineering standards, e.g. BS, ANSI, DIN and the like. Some of you may revel in the new found practicalities of outlook, wedding theory to the realities of producing 'something useful'. First a prototype, then something capable of enduring the harsh world of life in the hands of an uncaring customer. Others may have passed through this phase as yet another stepping stone, fascinating at the time, but drawn onward by the newly strengthened awareness of the need to make the product pay so that the organisation able to produce it survives. Others will achieved a widening awareness of how to beat the business competition, of the whole panoply of influences of the wider business world, of even national or world economics, of the seamier side of international business affairs, of economic imperialism, of outright political imperialism and hegemony --- which, depending on ones situation, one either benefits or suffers from.

As we all learn, how far each of us progresses along this road is the result of our deep seated inner qualities; introversion, extroversion, bravery, cowardice, arrogance, self effacement, practicality, curiosity, dominance, general intelligence, scientific intelligence, emotional intelligence, ties to place and family, family constrains and opportunities (some thrust upon us, some 'made'). There is no 'right' answer as to how far one travels. Every one of us is different, but many eventually perhaps feel frustrated as they find they in effect learn something too late. Their eventual personal desire to 'move on' frustrated by others perceived assessment of the appropriateness

of ones background, effectively ones c.v., and conflicting pressures, e.g. children settled into a good school.

You, who have, I presume, started in physics and gone out into engineering, have made greater moves along the general road outlined above than those who stayed in academia. It may be because when you 'came on the market' academe was not expanding and you weren't amongst the highest of high flyers. It may be because you had learnt what you wanted to know in academia and wanted to 'move on' in terms of your subject or your life in general. You may have thought you wanted to earn more money, or to make your own way, or to make use of more facets of your personality and abilities than seemed to be possible by staying where you were. Perhaps you're innate 'questioning', which had contributed to you studying physics in the first place, had begun to be directed into other than just the avenues presented to you by academia since your earliest days. Whatever the reason you were prepared to break out of the environment where your ego would be pampered by your academic achievements, where you could reflect in the 'halo' of the ivory tower, to look further a field. As time past the, 'Been there done that' perspective likely developed.

To return to the categorisations outlined above: clearly those in categories 5 and 6 (of the above numbered list) are in a very different working environment to that they experienced at university. However, for those in categories 2, 3 and 4 there is some similarity although for those in categories 4 and 3 and perhaps to a somewhat lesser extent those in 2, there is still considerable difference. Those in categories 3 and 4 probably feel much more clearly that they have a 'proper' R&D job, not so much on the edge, looking to find contacts with those that are in the 'main swim' e.g. a university department seeking to 'get in' on some 'real action' by doing a few short term contracts. You'll probably feel more in touch with the overall picture of what is attempting to be done within your company, e.g. design a new flow meter (if in category 4) or a new off-shore platform (if in category 3) and the way its requirements integrate with the whole. Particularly if in category 3 you'll likely be in a position to initiate sub-contracting, perhaps to a university, of some bit of theoretic analysis --- if you think it worthwhile getting the subcontractor 'up to speed' and in the right frame of mind, to take useful account of the very necessary engineering realities in a meaningful way. All this of course within an appropriate business envelope including maintaining appropriate security of your companies valuable 'know how' and the results of the work. Perhaps you even need to maintain secrecy that the sub contractor is working on the subject at all.

In total, what with such as that described above and other factors, it appears that in the EPG we have a group that IOP members seem to want to exist, they vote 'with their pens', but on the other hand don't require much activity from. Half of the IOP's total membership of circa 35,000 doesn't belong to any group at all. Current thinking

is that perhaps many of the EPG's membership 'sign on' uncaring of the additional small cost, hoping in some general way to keep more in touch with the IOP's overall activities. Thus they perhaps care little for what appears in the Newsletter, indeed, perhaps often hardly bother to read what items are included in it. This may seem difficult to admit, but perhaps not when compared with what is likely the common treatment of the IOP's main membership publication 'Physics World'. How many actually read more than say 80% of it. Surely many only quickly scan it through for seemingly interesting articles and then, if time permits, skip read their way along in more detail.

We attribute the failure of the networking, initiative, including when supplemented with a Bulletin Board then a List Server, to the fact that nobody in industry is actually going to turn to casual contacts of that nature. It would very likely be 'frowned upon' at a managerial level as potentially detrimental to the company, unquestionably so in a large company, perhaps less so in a small one.

As many of you will have become aware, every company is very different. Even those in nominally the same business can have surprisingly different ways of doing things depending on their history and efforts to strengthen their market position and the major players involved at any one time. A glaring example of this is the initial difference between two of the anti-trust court case fragments of John D. Rockefeller's Standard Old Company; Mobile Oil Company (the ex New York office with no oil fields) and Exxon (Esso) (the largest fragment with a lot of oil fields). Those superficially in the same business, but actually only loosely so, e.g. a state oil company, and a large Engineering Design Procurement (EDP) contractor such as Brown and Root, can have many even more different approaches, expertise and focus. Those further down the 'food chain', e.g. instrument and computer systems companies e.g. Siemens, or Yokogawa, who might make quite a lot of their group profits supplying such a market, will have yet different approaches again. Even the path taken by a single company at any one time can be very different depending on the prevailing market situation and personalities of the principle people involved, e.g. Shell's development of a large refinery furnace in the 1960's but general policy to 'buy out' what were probably inferior furnaces in the 1990's.

The variations are many and only those involved in any one area of business, e.g. aircraft, oil, weapons, get to achieve a detailed perspective of their industry and, partly by inference, industry as a whole. The less an individual is tied to any one employer, the better the vision. In these days of more rapidly changing markets and less all powerful, paternalistically minded employers --- even in the Far East, e.g. Hyundai --- there is a freer market for employees. This changing situation is not a new phenomenon. Even Mozart, in the music business of the late 1700's, both suffered, and benefited from a similar situation as society 'freed up'. The fact is, as many of you will know, the way each business makes its living, the way it carves out

a niche for itself, is unique. The situation is but a more varied version of the situation a university is in as it attempts to 'carve out a living' in the wider world. Within the UK, at least, the vast majority of universities are largely pawns in the field of government policy, in competition with others in the same country but also those further a field. Like all institutions, companies included, they are the victims, or beneficiaries, of world economics, their own history and the attractiveness, or otherwise, of the towns they are located in. University's similarities are that they are all in the same business, have the same profile of vertical integration but rather different profiles of horizontal integration, e.g. such as 'Imperial' focuses on science and technology, 'Kent' on the arts, those big and rich enough such as 'Cambridge' on a wide range of disciplines. Companies vary so widely that it is difficult to draw on similarities, except perhaps that they are committed to making a profit, those in such as Cuba perhaps accepted.

So it is with the IOP. It currently rests on the laurels of its publishing venture, but is ever under competitive pressure from other 'scientific' publishers, e.g. Elsevier. The IOP's 'golden goose' may not be as strong for ever. The IOP is making a 'good go' of letting out its property in London for conferences and meetings, but that too will perhaps not always be so successful. As a professional institution its raison d'être is perhaps currently has a bias towards the academic, for reasons outlined above, but it needs to keep in touch with its 'other self', those in industry. In our own different ways we members of the EPG gain something by belonging to the institute. We have much to offer the IoP although it may sometimes seem both to ourselves and others within the institute that we haven't. We know, having left academia that we now have a different profile, but we were still raised as physicists. As at least surely every teacher knows there is something in the old Jesuit saying, "Give us a boy and we'll return a man." We initially selected ourselves and were selected to specialise in physics. Our psychological make up is still basically the same, and that is not necessarily quite the same, on average, as our colleagues raised through purely engineering channels. Psychometric testing has shown pure scientists have thought patterns closely allied to those of artists, engineers to those of accountants. Physicists still have a propensity to look for fundamental causes, to 'really' understand what is before us, not just skate along on the surface. We may have found it hard in industry to learn to 'skate', and perhaps to develop emotional intelligence, an area in which physicists are typically not so strong. But then if, and as, we climb the corporate ladder we have characteristics that are extremely valuable at the very highest levels of management.

The EPG is perhaps a route by which our talents and experience, however far we travelled along the career path as outlined above, can be fed back into the IOP to help it maintain and develop a platform for others of a like mind in the future. Ultimately it is perhaps something to do with maintaining a worthwhile balance in society as a whole, and I am not just talking about society in the UK, but in human society on a

global scale --- since that is to where we must look in the future. Some of you may recall it was a theoretical physicist, with a very extrovert and ‘down to earth’ practical streak, Richard Feynman, who was chosen to head the inquiry into the Columbia Shuttle disaster, not a ‘pure bread’ engineer.

Because the EPG has not followed the pattern of the majority of the IOP’s groups, as regards; the organisation of frequent meetings and conferences and the publication of its Newsletter, there are those within the IOP that have thought that it something of a ‘square peg in a round hole’ that should perhaps be closed down. One of the concerns was that it didn’t provide ‘value for money’ and the large revenue it inevitably collected each year, as a result of its relatively large membership, was not appropriate for what it provided. However, I believe there is a place for the EPG but, from past experience, it will in general be rather different to other groups. I believe that the majority of its members, certainly most of those in industry, do not want it to offer a great range of services or, if they prefer it, are not prepared to fulfil the necessary requirement of contributing to bring it about. However, I do think they want a slightly stronger link into the IOP, and believe that by belonging to the EPG, a none specialist group, discipline wise, they have a way to achieve it. I also believe that by merely belonging to the group its members provide a useful service to the IOP as a whole by way of its committee’s participation on other committees within the IOP. As such they perhaps do a little to help maintain something of the original balance that was hoped for when the IOP was formed.

It is perhaps worth noting that recent budgetary changes within the IOP as a whole have addressed the above mentioned financial issue since we, like all the other groups, are now only allocated from central funds what budget we claim and justify --- in many ways a more ‘normal’ budgetary system by today’s standards. Also, a tightening up of other rules within the overall IOP makes it less likely that any small group of individuals will dominate the group’s committees year after year, a weakness that some other institutions suffer. As it happens this has never been a problem with the EPG. Our problem has always been getting any members willing to sit on the committee and participate. At least the change forces a constant roll over of personnel, a ‘medicine’ that will either help improve or kill the patient in our case.

Willingness to perhaps volunteer to sit on the EPG committee at some stage in ones life is only one of the desirable attributes of the members of this group. It is also desirable that they perhaps answer some questionnaires aimed at assessing whether we are ‘going in the right direction’. Also, that they perhaps contribute the occasional short article for publication in the Newsletter.

Please answer the simple informal questionnaire, see the article ‘Comments Please’ (below) and if possible, send a short piece for our next Newsletter as described in, ‘A Note from your Chair’ (above).

Synergy for Success: A successful conference held at the Institute of Physics, London on 5th October 2006

By Tom Shelley

I kicked off the day's proceedings by reminding everyone about some of the enormous challenges that the human race is facing in terms of meeting increasing global demands for resources, particularly for energy, which it has to meet while maintaining sustainability and without wrecking the climate, and how finding solutions will depend on a combination of engineering and physics.

The first keynote paper was given by Professor Graham Martin from the Institute of Manufacturing at Cambridge, delivering a discourse on some of the physics based studies that have been undertaken on inkjet printing. We learned about the two major differences between systems - those that produce drops all the time, some of which are allowed to impact on their target, and drop on demand, where droplets are only produced as required. Apart from the huge demand for computer printers, he also mentioned the development of inkjet printing of biological devices such as sensors and structures for use in the human body.

The second paper was presented by M Teodorescu from City University on the physics of interactions between micro engineered silicon gears. He said that the first silicon micro gears were cut by laser and run dry but they, "break immediately." Moisture and conventional lubricants cause them to stick so there has been the development of monolayer, protective lubricant coatings put in place by vapour deposition. While most of us had understood these might be used in mechanisms in the human body, Mr Teodorescu revealed that they were being developed by the US Department of Defence for use in bomb mechanisms and that they "Are said to have spent billions of dollars on it."

Then followed the paper that many had been particularly looking forward to: an exposition by Dr Andrew West and Laura Justham from the Sports Technology Research Group at Loughborough University about a novel cricket ball throwing machine developed to help train elite players. The aerodynamics of a rotating cricket ball in flight are most complicated, but the new machine is capable of reproducing any type of ball delivery from any type of bowler. Present machines are completely impersonal. Real batsmen see from the way real bowlers hold the ball and prepare to deliver, what they are intending to do. The intention is to have a moving image of a bowler on a screen while the machine spits out the ball in a manner similar to that which the real bowler would have used under those circumstances. Ultimately, it is hoped to display fielders and the crowd on side screens to make the whole thing a real virtual reality experience for young cricketers both to learn from and as an entertainment. The machine is currently at working prototype stage

The design of magnet coils on arbitrary surfaces to deliver specific field configurations was the subject of a paper delivered by Dr Arthur Jones from the University of Nottingham, co- authored by Dr Liviu Marin. The intention is to allow coils to be made more closely conforming to the human body shape for MRI machines, while producing better scanner images, but the idea is also applicable to the development of any electrical machine. Whereas the conventional way of designing an electromagnet is to design a coil, see what field is produced and then adjust the coil design, the seven strong team at Nottingham, which is made up of engineers, physicists, and a mathematician, working together, has inverted a new process based on the boundary element method, (BEM). Dr Jones described the tool as a means to, "Calculate the current densities required to provide a uniform gradient of magnetic field in a specified direction within the constraints of what is physically possible." Dr Marin subsequently explained that, "The most important feature of this novel BEM is that it automatically satisfies the divergence-free condition that is the conservation of charges." The team applies it to the problem of specifying the field gradient that is desired, and the surface that the conductors are to be placed on, and then uses it to work out exactly where the conductors need to be to be placed to achieve the desired current densities and so the desired field configuration.

Roger Traynor, who is the Vibration and Velocity Products Specialist with Lambda Photometrics at Harpenden, then delivered a paper on Laser Doppler Vibrometers and Laser Surface Velocimetry. He said these techniques made it possible to make displacement measurements with accuracies from down to 2 picometres to 100mm, at movement speeds from less than 1 micron/s to 30m/s, over the near DC to 30MHz frequency range.

Applied to laser interferometers, the method has been used to measure ripples in the sides of a stylus in an atomic force microscope and the operation of valves in Formula 1 engines running at 19,000 rpm. Routinely deployed in the development of hard disk read-write heads, the technology is currently being applied to applications as varied as studies of insect wing mechanisms with a view to making micro UAVs and improving the performance of motorised toothbrushes.

This was followed by a paper by Professor Alan Blyth, head of the National Centre for Atmospheric Science at the University of Leeds about the development and testing of instruments to improve the forecasting of severe convective storms. Sophisticated equipment is apparently already in place and various locations, and we can only hope that with improved understanding of the physics of these phenomena, the required result will be achieved.

After lunch, Professor David Infield of the Department of Electronic and Electrical Engineering at Loughborough University and CREST, the ‘Centre for Renewable Energy Systems Technology’ talked about some advances in 'Green' energy. He said that the annual rate of growth of wind energy was 24% per annum and that of solar

photovoltaics, 17%. The efficiencies of solar photovoltaics was rising steadily, especially thin film cells, which are cheaper than massive silicon, with CuInSe2 at 18%, CdTe 16%, and amorphous Si at 12%. He said that thin film cells can be layered on top of each other and that NASA cells were now approaching 40%. He also described hybrid cells, especially a combination of a dye cell on top, absorbing light in the 400 to 700nm band and CIGS = CuInGaSe2 underneath absorbing in the band 550 to 1000nm which give a tandem efficiency of 15.1% producing 1.45V at 14.1mA/sq, which he described as showing "Very good early stage efficiencies". He briefly described an innovative ducted, horizontal axis, cylindrical wind turbine for building into house roofs.

In contrast, Dr Nigel Buttery from the Sizewell B Power station talked about nuclear power and kept making statements about how safe it was. Still on the grand scale, Professor Phil Burrows, who is professor of accelerator physics at the John Adams Institute at Oxford University described the next generation accelerator, the International Linear Collider, which will require focussing, "10MW into micron sized beams which will be accelerated and steered over kilometres, focussed to nanometre sizes and made to collide." The engineering challenges sounded most impressive.

This was followed by Dr Maggie Aderin, project manager with Surrey Satellite Technology who talked about a "Constellation" of small satellites put up by Turkey, Algeria, the UK, Nigeria and China, which spends 5% of their time monitoring disaster areas and 95% of their time monitoring agricultural usage. Nigeria Sat 1 was put up in 2003.

On a completely different topic, Professor Derek Fray from the Department of Materials Science and Metallurgy at the University of Cambridge explained processes he has invented and developed to recycle electronic printed circuit boards for recycling. Presently these mostly end up in China and other countries in the Far East where the solder is melted off in unsafe conditions. His process used 0.3M HBF4, which dissolves all the solder, which can subsequently be recovered using electro-winning, and releases all the components. The boards are then shredded and copper, silver and gold leached out and also subsequently recovered. The process has been patented, has progressed to pilot plant stage and is now being evaluated in China for commercial use.

Still on the subjected of metallurgy, this was followed by two papers from Corus, one on continuous steel casting and the other on a new technique to discover defects within hot steel emerging from such a caster. This is being developed by Ian Baillie, based in the Corus Teesside Technology Centre as his Engineering Doctorate project at the University of Warwick. The idea is to hit the steel with a laser pulse and pick up the resulting ultrasonic shock waves as they emerge from the steel surface. The idea has so far been tested on moving steel bars at 800 deg C in a laboratory and seems to work well.

The last paper was given by Dr Kain Hing, from the Interdisciplinary Research Centre at Queen Mary College, London on Biomaterials, "Where biology, chemistry, engineering and medicine meet." The centre is primarily working on advanced human implants to encourage bone and nerve re-growth, among other things.

Network Revival? Help sought by Members from Members?

By Samantha Davidson

Many physicists working in industry find themselves working in relative isolation, having little contact with other physicists. The need might arise for advice on, say, how to make a certain measurement, how the latest legislation affects the technical aspects of your work or what sources of technical assistance are available. The internet can be a great help, but nothing beats talking to someone with relevant information or expertise.

For many years the Consultancy Group of the Institute has successfully run a Consultancy Group Network that enables members to access the knowledge and expertise of the other network members. The topics raised on the network typically relate to either help with client enquiries or seeking a more appropriate consultant for a particular client. The network operates as an e-mail list server, with enquiries and replies (unless sent privately) being broadcast to all network members.

We in the Engineering Physics Group have likewise long had this facility available, see out web site, but to date it has hardly found usage. We again remind you of its existence. The best way to let us know that you find it useful is to use it. We also point out that within our EPG web site there is a list of some of our members technical specialisms and that the list server can merely serve as a way to make initial contact. Thereafter, should you prefer it; there is of course always the telephone.

Visits

From the IOP's point of view there is always the dilemma as to whether visits to places of scientific interest should be organised on a regional or specialist group basis. Obviously there are some advantages if organisation is regional and attendees don't have too to travel too far, but then the UK is not so rich in sites of interest that those further a field might not wish to travel quite large distances if appropriately notified and given the opportunity. In the case of the EPG the problem is aggravated by the fact that quite a large proportion of our membership is not even within the UK. However, we have two events currently planned as follows. Both are in the UK in the south of England. For those of limited financial means we are offering a few travel grants. Please e-mail our secretary, Samantha Davidson (s.davidson@physics.org) both if you wish to apply for a place on a visit and, making your case, if you wish to apply for a grant.

If you wish to attend please apply soon in order to allow the establishments being visited to run basic security checks on you. An essential requirement, I'm afraid.

The visits are:

- Wednesday 23rd May 2007: Visit to **UKAEA Culham** for a short presentation about the Joint European Torus (JET) project and a look around the facilities. This is currently the site of the international project to research and develop the production of electricity by way of nuclear fusion. Perhaps the only decent solution for the world's base load energy shortage.
- Saturday 14th July 2007 July: visit to the **Diamond Light Co**. at the Rutherford Appleton Laboratory, Chilton Campus, Harwell. This is a newly built Synchrotron Facility, covering an area equivalent to five football pitches, set up to work like as a series of super microscopes.

Comments Please

We, your committee, are very keen to hear of any comments, or thoughts you may have following your reading of this Newsletter. Rather than try and concoct some formal looking questionnaire, as we have done in the past, we think it might be better on this occasion if we leave things 'open' for you to just e-mail us about what you think. So, please send your comments to Samantha (s.davidson@physics.org)

Events of interest

Please see our website at:

http://www.iop.org/activity/groups/professional/eng/index.html

Ideas for future meetings

The Group welcomes ideas from its members, topics for future events. Please contact the Chair (John Battye) or Secretary (Samantha Davidson).

Your EPG Committee '06/'07

Dr John Battye (Chair)	john.battye@physics.org
Dr Samantha Davidson (Secretary) (acting)	s.davidson@physics.org
Dr John H. Milner (Treasurer) (acting)	J.H.Milner@city.ac.uk
Dr Victoria Weiss	VLWEISE@qinetiq.com
Dr Alison McMillan (co-opted)	alison.mcmillan@physics.org
Dr Roger Hill (co-opted)	roger.hill@virgin.net
Dr Tom Shelley (co-opted)	Tshelley@Findlay.co.uk

(Remember we are looking for new committee members. If you wish to join please contact John Battye)