

Viewpoint

The incomprehensibility principle

Gordon Fraser, long-time editor of *CERN Courier*, ponders on paying attention.

Educators and psychologists invented the term “attention span” to describe the length of time anyone can concentrate on a particular task before becoming distracted. It is a useful term but span, or duration, is only one aspect of attention. Attention must also have an intensity – and the two variables are independent of each other. Perhaps one can postulate an analogue of the Heisenberg uncertainty principle, in which the intensity of attention multiplied by its span cannot exceed some fixed value. I call this the “incomprehensibility principle” and I have had plenty of opportunities to observe its consequences.

In the hands of skilled presenters, information can be carefully packaged as entertainment so that the attention needed to digest it is minimal. The trick is to mask the effort with compelling emotional appeal and a floppy boy-band haircut. However, the need to pay attention is still there; in fact, absorbing even the most trivial information demands a modicum of attention. How many of us, when leaving a cinema, have had the nagging feeling that although the film made great entertainment some details of the plot remained less than crystal clear?

The existence of a minimum level of attention suggests that it is, in some sense, a quantum substance. This means that under close examination, any apparently continuous or sustained effort at paying attention will be revealed as a series of discrete micro-efforts. However, while attention can be chopped up and interleaved with other activities, even tiny pulses of attention demand full concentration, to the exclusion of all other voluntary activities. Any attempt at multitasking, such as using a mobile phone while driving a car, is counterproductive.

The incomprehensibility principle plays a major role in education, where it is closely linked to the learning process. Because of the subject matter and/or the teacher, some school lessons require more time to



Gordon in 2002.

assimilate than others. This trend accelerates in higher education. In my case, a hint of what was to come appeared during my third year of undergraduate physics, when I attended additional lectures on quantum mechanics in the mathematics department at Imperial College London.

My teacher was Abdus Salam, who went on to share the Nobel Prize for Physics in 1979. Salam's lectures were exquisitely incomprehensible; as I look back, I realize he was probably echoing his own experiences at Cambridge some 15 years earlier at the hands of Paul Dirac. But he quickly referred us to Dirac's book, *The Principles of Quantum Mechanics*. At a first and even a second glance, this book shone no light at all but after intense study, a rewarding glimmer of illumination appeared out of the darkness.

Motivated by Salam's unintelligibility, I began postgraduate studies in physics only to find that my previous exposure to incomprehensibility had been merely an introduction. By then, there were no longer any textbooks to fall back on and journal papers were impressively baffling. With time, though, I realized that – like Dirac's book – they could be painfully decrypted at “leisure”, line by line, with help from enlightened colleagues.

The real problem with the incomprehensibility principle came when I had to absorb information in real time, during seminars and talks. The most impenetrable of these talks always

came from American speakers because they were, at the time, wielding the heavy cutting tools at the face of physics research. Consequently, I developed an association between incomprehensibility and accent. This reached a climax when I visited the US, where I always had the feeling that dubious characters hanging out at bus stations and rest stops must somehow be experts in S-matrix theory and the like, travelling from one seminar to the next. Several years later, when I was at CERN, seminars were instead delivered in thick European accents and concepts such as “muon punch-through” became more of an obstacle when pointed out in a heavy German accent.

Nevertheless, I persevered and slowly developed new skills. The incomprehensibility principle cannot be bypassed but even taking into account added difficulties such as the speaker's accent or speed of delivery – not to mention bad acoustics or poor visual “aids” – it is still possible to optimize one's absorption of information.

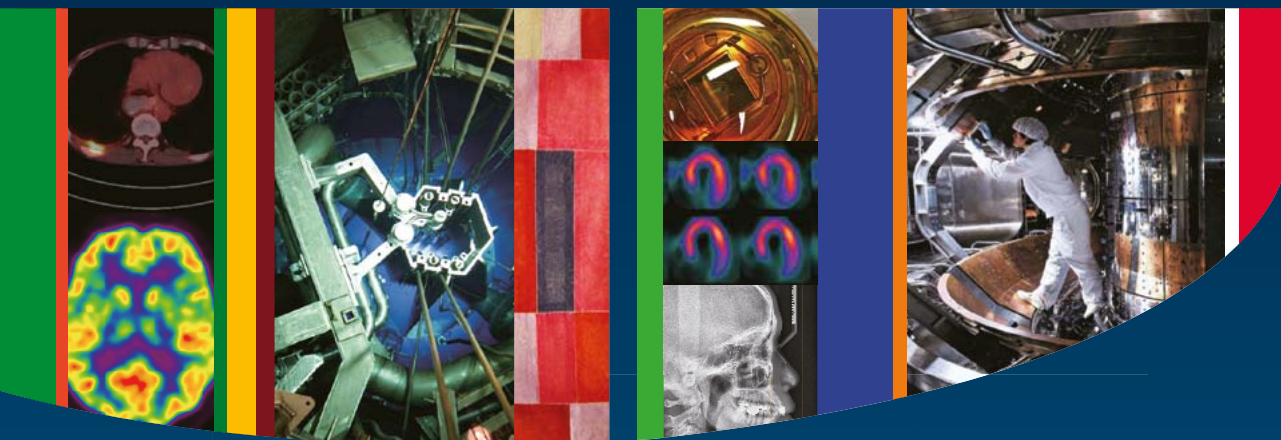
One way of doing this is to monitor difficult presentations in “background mode”, paying just enough attention to follow the gist of the argument until a key point is about to be reached. At that moment, a concerted effort can be made to grab a vital piece of information as it whistles past, before it disappears into the obscurity of the intellectual stratosphere. The trick is to do this at just the right time, so that each concentrated effort is not fruitless. “Only cross your bridges when you come to them”, as the old adage goes.

By adopting this technique, I was able to cover frontier meetings on subjects of which I was supremely ignorant, including microprocessors, cosmology and medical imaging, among others. Journalists who find themselves baffled at scientific press conferences would do well to follow my example, for the truth is that there will always be a fresh supply of incomprehensibility in physics. Don't be disappointed!

● Gordon Fraser. Gordon, who was editor of *CERN Courier* for many years, wrote this as a ‘*Laternal Thought*’ for *Physics World* magazine but died before the article could be revised (see obituary p36). It was completed by staff at *Physics World* and is published in both magazines this month as a tribute.

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CERN Courier – digital edition

Welcome to the digital edition of the March 2013 issue of *CERN Courier*.

The LHC may be currently leading studies of particle physics at the high-energy frontier but the particle-physics community has for several years been looking hard at what machine should complement the LHC in future. The favoured option, a high-energy linear electron–positron collider, has been the focus of two international efforts that are now coming closer together. This month’s lead feature reports on a meeting at the 2012 IEEE Nuclear Science Symposium, which provided the opportunity to discuss the technological developments on a broader stage. Meanwhile, after a successful period of proton–ion collisions, the LHC has entered its first long shutdown, which will see a huge effort in maintenance and consolidation.

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