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InfoTech Pharma: the information revolution in the pharmaceutical industry

Key IT personnel from the major companies gave presentations at IBC's inaugural industry-wide European IT conference and exhibition *InfoTech Pharma '97* at the Olympia conference centre in London. The conference was streamed into various focal areas discussing IT strategies for the different functions within the industry, including R&D, sales and marketing, regulatory affairs and manufacturing. This provided the opportunity for delegates to update themselves on those IT developments most relevant to their professional roles.

IT in pharma R&D strategy – case studies

Merck
Dr Charles Popper (Merck & Co, Inc., USA) gave a keynote address to open the first session of the conference, in which he described Merck's holistic, process-oriented approach to the development of systems for pharmaceutical R&D. A detailed and workable strategy emerged, in which the company's overall business IT infrastructure is integrated with that of R&D. Dr Marcia Zweerink (Merck & Co, Inc., USA) showed how the company has developed and implemented a web-based strategy for the internal management of information inside the corporate firewall. Comparing the profound impact of the WWW on information-sharing externally with that conducted within the company,

Dr Zweerink emphasized that intranets must be well-managed (in contrast to Tim Berners-Lee's concept of the 'self-managed' WWW). Among the potential pitfalls of an unmanaged intranet are security with proprietary information, copyright violation, a highly variable quality of information and increasingly difficult navigation.

Merck included NetScape in its infrastructure in '95, with the result that '40,000 people are running the same client'. There was clearly a lot of interest in the development of the company's intranet.

Novartis
The merger between Ciba-Geigy and Sandoz to form Novartis was made logistically easier by their sites on the banks of the Rhine being adjacent, but the challenge of how to integrate their large existing IT infrastructures rationally, and according to business requirements, is perhaps not so easy. Dr Rene Ziegler (Novartis Pharma, Inc., Basel, Switzerland) described some of the problems and how they are being overcome. Dr Ziegler presented two business models that should facilitate an effective IT infrastructure for R&D in any large pharmaceutical company, but at a cost (for example, SFr 67 million to install Windows NT).

Zeneca
Dr Neil Sutchbury (Zeneca Pharmaceuticals, Alderley Edge, UK) gave an outline of Zeneca's recent IT project, 'Vista',

which received board-level backing after a change of CEO in 1995, with the aim of standards-based, global information sharing within the company.

'ISDN: I Still Don't Need It' – Dr Chris Jones of CERN

Zeneca have not yet combined their several intranets, but intend to do so, providing a common interface via a single, customizable web-browser. The goal is a single international chemical/biological database, and to combine new data with historical data from legacy systems more easily. 'Old' IBM systems at plants all over the world are now managed using 'object broker request' technology from Digital, streamlining the processes of manufacture and distribution. In a 'framework-based environment', database queries are wrapped specifically for each system before processing, and this stock query system is now in place in eight countries, communicating via a TCP/IP WAN. In a few years, the company has merged eight separate database management systems into one [Oracle/ISIS(MDL)] with flexible access. Two-thirds of desktops are now linked through Windows NT servers.

As a result of the Vista project, Zeneca now have half as many application and development support staff than they had in 1992, with concurrent breakthroughs in document handling in regulatory

submission (reduced from months to a few weeks in Europe, by direct electronic submission of a single managed version of the documentation in Microsoft Word, to which comments are appended *en route* using Adobe Acrobat).

However, Dr Sutchbury stressed that in order to benefit from IT projects like Vista, board-level backing is essential: many attempts to reorganize a company's R&D infrastructure founder as a result of lack of funding and consensus.

Bioinformatics – a key driver for R&D

Pharmaceutical research is being revolutionized by new technologies: target discovery and validation (genetics, genomics, bioinformatics), and lead discovery and optimization (automated handling, combinatorial chemistry and high-throughput screening). We now have a plethora of targets and compound libraries, and screening can (must) be exquisitely focused. Decision making is now reliant upon many new IT systems, which often must be integrated with existing proprietary, or 'legacy', systems.

One stream of InfoTech Pharma dealt with the approaches to bioinformatics taken by some pharmaceutical companies, as well as recent developments in the field made by non-profit organizations, such as the European Molecular Biology Laboratories and the Human Genome Project Resource Centre. It is interesting to see how the industry has developed its bioinformatics capabilities in the past year, companies in many cases incorporating the programmes into their business infrastructures, recognizing that bioinformatics is already acting as a key driver in pharmaceutical R&D.

Genomics reveals targets

Dr William Haseltine (Human Genome Sciences, Inc., Rockville, MD, USA) outlined the benefits from genomics that are already here, and those that are yet to come, in describing some of the successes of Human Genome Sciences (HGS) in the discovery of medically useful genes. Looking at mRNA expression in different organs and cell types, as well as in cells

undergoing effects such as stress, aging and differentiation, HGS creates an 'inventory' of gene expression. This is used to pinpoint candidate genes and their expressed products, often with startling success, notably their discovery of 18 novel chemokines when they looked at 7TM receptor proteins in their database, and the discovery of a novel cathepsin protease indicated as a therapeutic target in the treatment of osteoporosis (the latter work has been in collaboration with SmithKline Beecham Pharmaceuticals, UK).

Java tools

Dr Andrew Lyall (Glaxo Wellcome R&D, Stevenage, UK) described Glaxo Wellcome's collaboration with Oxford Molecular Group (Oxford, UK) in the development of 'next generation bioinformatics applications'. Five full-time postdoctoral researchers are writing in Java, and the programmes 'will be made freely available from a WWW server'.

'Scope Creep is a perennial problem' – Dr Charles Popper of Merck on how projects always seem to expand beyond their original remit.

'Interoperability' being the current buzzword, Java is also becoming the language of choice for the bioWidgets Consortium and the Open Molecule Foundation, whose aims are to develop a consensus on standards for bioinformatics components and graphical displays, providing reusable, pre-competitive applets and Java packages. For more information about these projects, visit their respective Web sites (Box 1). The free distribution of software, such as RasMol, has proven benefits, not least in that it helps to propagate standards. Glaxo Wellcome are also working with MDL to further develop software to visualize molecules, which they say 'will be free to non-profit organizations'.

European Bioinformatics Institute

The European Bioinformatics Institute (EBI) is fully committed to the common

object request broker architecture (CORBA) standard for building interoperable software. Dr Matteo diTommaso (EBI, Cambridge, UK) described the EBI's core nucleotide, protein sequence and structure databases, as well as some of the smaller ones, such as Hmut (Human mutation), RHdb (radiation hybrid), LIGM (immunoglobulins) and MitBase (mitochondrial genome). A recent development is the release of TREMBL, a supplement to SWISS-PROT, which automatically annotates queries with data from the EMBL nucleotide sequence database. In addition to developing their own Java applets for access to CORBA database servers, the EBI will be able to exploit NetScape's recent inclusion of Visigenic's (San Matteo, CA, USA) CORBA implementation, which should eliminate the need to distribute individual CORBA classes with each application.

Human Genome Mapping Project

On completion, putatively in 2001, the human genome is expected to contain 3–4 times the total amount of sequence data currently available in the EMBL/GenBank/DDJB nucleotide database. Dr Martin Bishop manages the computing group at the UK Human Genome Mapping Project (HGMP) resource centre (Cambridge, UK), and outlined the databases and access tools they make available. A recent development is the creation of 'EUCIB', the European collaborative interspecific mouse backcross database, for which the resource centre provides a mapping service.

Advanced computing strategies for lead discovery

In another subject stream, speakers dealt with some of the advanced computing strategies they are implementing for lead discovery.

Following a keynote address by Dr Ian Shaw (Boehringer Ingelheim, Vienna, Austria) several leading third-party vendors of software solutions made presentations, including updates from MDL (San Leandro, CA, USA), Chemical Design Ltd (Chipping Norton, UK), Oxford Molecular

(Oxford, UK), Proteus Molecular Design Ltd (Macclesfield, UK); and Tripos, Inc. (St Louis, MO, USA).

SpaceCrunch: the world's largest chemical database

Tripos, Inc. and the Silicon Graphics European Chemistry Technology Center (Basel, Switzerland) put their respective talents together in December to produce 'SpaceCrunch', a web-based project similar in nature to 'Genecrunch' earlier last year, in which they collaborated with the EMBL to quiz the raw DNA sequence data for the (nearly) complete yeast genome [see *Drug Discovery Today* (1997) 2, 43–45 and the GeneQuiz Web site in Box 1].

> 'My modem doesn't go that fast' – Mike Palmer of Zeneca on Microsoft's vision of the future.

Using Tripos' 'ChemSpace' technology and a Silicon Graphics POWER CHALLENGE equipped with 24 CPUs and 20 Gbytes of disk space, the 'SpaceCrunch' database containing the information for 170 thousand million compounds was created in 15 days and searched at rates of between 140 and 500 million compounds/CPU/h, meaning that a query of the entire database could be completed overnight. Researchers were invited, via the Web, to submit queries in the form of sketched molecules, drawn using Java applets provided by Tripos, and the results of five selected queries were published on the Web (see Box 1 for URLs). Not surprisingly, the database was protected behind a firewall.

What to do with such a large amount of data is not a trivial problem. According to Silicon Graphics, 'the SpaceCrunch team and data-mining solutions partners are currently exploring mining and visualization prototypes'
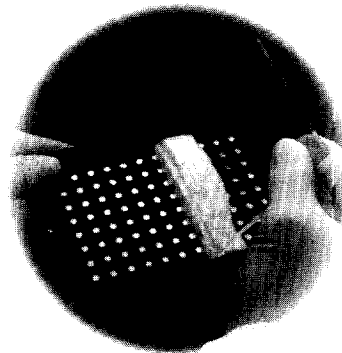
InfoTech Pharma '98

With its conveniently streamed sessions and high attendance, InfoTech Pharma promises to be a major yearly event, providing annual overviews of the state of the pharmaceutical industry's progress in dealing with the challenges of new technologies and a changing market. For information on *InfoTech Pharma '98*, and other IBC conferences, contact Jessica Robertson, IBC UK Conferences Ltd, Gilmoora House, 57–61 Mortimer Street, London, UK W1N 8JX. tel: +44 171 637 4383, fax: +44 171 631 3214.

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