25 years of Matrix Science

(Condensed into 12 slides)

Matrix Science is 25 years old. This talk condenses some of the milestones and highlights from the past 25 years into just 12 slides. Obviously it won't cover everything and it's not a full timeline. Whether you've used Mascot for one month or two decades, thank you for staying with us.

Timeline 1998-2007

{MATRIX SCIENCE}

- **1998: Matrix Science Ltd founded by John Cottrell and David Creasy**
- **Mascot Server**
  - Based on MOWSE III (Imperial Cancer Research Fund), Pappin & Perkins
  - Mascot Server 1.0 released 1999
  - Free service at matrixscience.com since Nov 1998

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Matrix Science Limited was founded by John Cottrell and David Creasy in 1998. The company is based in London, United Kingdom. You can see the original logo at the top of the slide, the blue and red text in curly brackets.

John and David spotted a gap in the proteomics market at the time, which was lack of software solutions for scalable, high throughput protein identification from mass spectrometry data. Software like SEQUEST was available, but these was tied to a specific vendor. There was no product that worked with data from every vendor.

The first product was Mascot Server, launched in 1999, and filling exactly this gap. The core algorithms for peptide identification were based on MOWSE III, licensed from the Imperial Cancer Research Fund. MOWSE III was developed by David Perkins and Darryl Pappin. Mascot Server has been vendor independent since the beginning and works with mass spectra from almost any instrument.

Mascot Server actually first became available for free on our website, matrixscience.com, in November 1998. The free Mascot service has been running for 25 years. The first version of Mascot Server was shipped to customers in 1999.

Timeline 1998-2007

- **Mascot Daemon**
  - Automation client, launched in 2000
- **Mascot Distiller**
  - GUI program for raw files, launched in 2003
- **Mascot Parser**
  - API toolkit, launched in 2002
- **Subsidiaries:**
  - 2001, Matrix Science Inc. (USA & Canada)
  - 2003, Matrix Science KK (Japan)

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The following year, we launched Mascot Daemon. This is the Windows automation client for Mascot Server, which allows queueing and running database searches in batches.
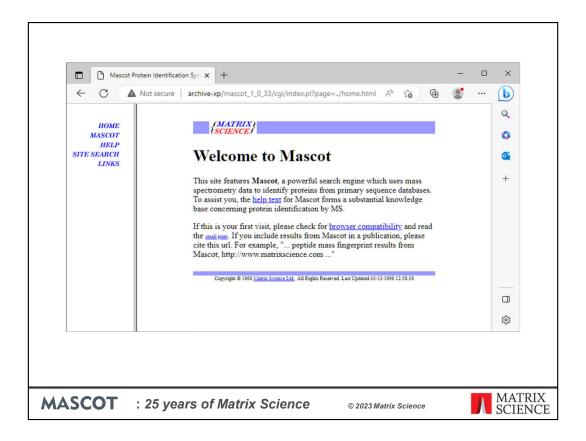
Mascot Distiller was launched in 2003. Distiller is a graphical Windows application that provides access to raw mass spec data files, direct from the instrument. Distiller provides vendor independent peak picking, and the peak lists are submitted to Mascot Server for database searching. You can then review and overlay the peptide matches on top of the raw MS/MS spectra in Distiller.

We also launched Mascot Parser in 2002. Parser is the application programming interface for Mascot results files, which is used by all our products as well as third-party software.

By this time, the company had grown from two employees to 4-5.

In 2001, our North American subsidiary Matrix Science Inc. was founded for sales, marketing and support in North America. We also hosted the first annual User Meeting at ASMS 2001. Then, in 2003, Naoki Tanaka-san and Itaru Usami-san

founded Matrix Science KK in Japan. MSKK has provided Mascot sales, marketing and support in Japan ever since.
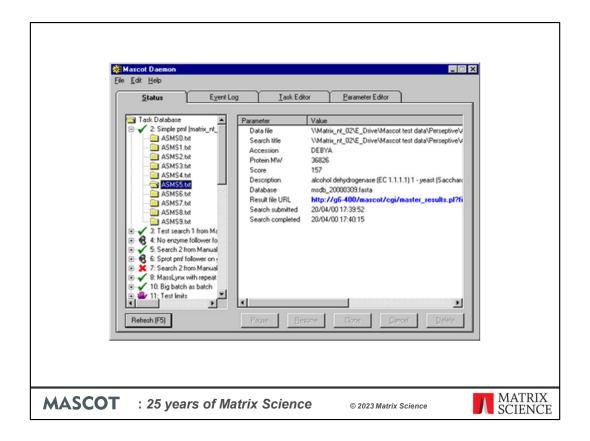
A quick screenshot of the very early version of Mascot Server. We still have version 1.0.33 running in a Windows XP virtual machine.

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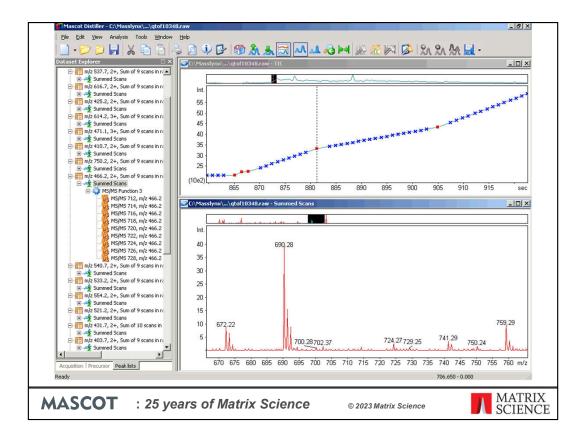
Here's a photo of the Mascot Server 2.1 installation CD from 2005 and the Distiller and Wizard CD from 2003. All software distribution back then was by mailing CDs in the post. Later on we moved to DVDs, and in the past few years we and everyone else have obviously switched to digital distribution.

Back in 2004, Mascot Wizard was a drag'n'drop automation client mainly for PMF searching, similar to Mascot Daemon. It was discontinued a couple years later.

A quick screenshot of the very first version of Mascot Daemon running on Windows 2000. The basic design hasn't changed much.

And here's a screenshot of Mascot Distiller from 2005, which would have been version 2.0. The user interface elements are familiar, although the backend code has been vastly improved and extended since then.

Timeline 1998-2007

{MATRIX SCIENCE}

- **Many new features!**
  - Error tolerant searching, Mascot Security
  - Decoy database searching, quantitation
  - Enzyme mixture, 64-bit, new instruments, ...
- **Other milestones:**
  - 5 scientific publications describing Mascot
  - 10 millionth free Mascot search in 2007
  - Bruker, Kratos/Shimadzu, SCIEX, Thermo Scientific, Micromass/Waters, Mass Solutions Technology (Taiwan)

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In the first decade of Matrix Science, we had 8 major releases of Mascot Server; three major releases of Mascot Distiller; and similar numbers of releases for Mascot Daemon and Mascot Parser. Many new features were introduced that nowadays form a core part of Mascot functionality, like error tolerant searching, Mascot Security, decoy databases, quantitation and so on.

We also had five scientific publications describing Mascot. To cap off the first decade, the 10 millionth free search was submitted at our website in 2007. And this is in addition to the millions more that have been run on in-house Mascot systems.

We also had software distribution agreements in place with a number of instrument vendors: Bruker, Kratos/Shimadzu, SCIEX, Thermo Scientific and Micromass/Waters. And we had our first regional distributor Mass Solutions Technology in Taiwan.

Timeline 2008-2017

- **Server 2.3 to 2.6, Distiller 2.3 to 2.6:**
    - Distiller quantitation toolbox
    - Protein Family Summary, integrated Percolator
    - Database Manager, site analysis (Mascot delta score), Report Builder
    - Chimeric spectra, Spectrum Viewer, spectral libraries
    - mzML, mzIdentML, mzTab
- **Plus many minor/patch releases**

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On to the second decade. We had a new logo designed around 2012, which you can see in the top corner.

We concentrated on improving the core products. The Distiller quantitation toolbox was introduced in 2008, initially supporting several metabolic and isotopic quantitation methods. Nowadays, the quantitation toolbox also supports many label-free methods. Mascot Server 2.3 included the new Protein Family Summary report and Percolator; version 2.4 introduced Database Manager and modification site analysis using Mascot delta score; then version 2.5 added support for chimeric spectra and 2.6 spectral libraries. This is just the highlights and there were many more changes and improvements.

In the second decade, the company had grown to between 5 and 8 employees. Nowadays the company has stabilised to 8 employees.

Timeline 2008-2017

- **2004-2010: Mascot Integra, RIP**
- **2013-2015: Mascot Insight, RIP**

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We had two other products, which were discontinued long ago. Mascot Integra was an early attempt at proteomics data and sample management based around a LIMS package from LabVantage. It was discontinued in 2010, because most customers who had Mascot Server did not desire a full LIMS solution.

Mascot Insight was a brief product between 2013 and 2015. Insight was the successor to Mascot Integra, but it concentrated on data reporting and visualisation. Much of the reporting functionality has since then been added to Mascot Distiller.

Timeline 2008-2017

- **Other milestones:**
  - 2012: Company blog started
  - 2013: 20 millionth free Mascot search submitted at matrixscience.com
  - 2014: Monthly newsletter launched
  - 2014: Free online training course launched
  - New distributors: Cloud Scientific (China) and SMAnalytical (South Korea)
  - Mascot cited by thousands of journal articles

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Other milestones in the second decade are shown here.

We started a monthly blog on the company website over 10 years ago, in 2012. We have blogged every month since then, including details on new Mascot features, tutorials, various topical issues in proteomics and so on.

In 2014, we started a monthly Mascot newsletter. The 100th consecutive issue was actually this March, 2023. The newsletter has a summary of our blog, a featured publication using Mascot and a monthly Mascot tip. If you'd like your publication to be featured in the newsletter, just send us a link by e-mail.

We also launched a free online training course in 2014. This started as a recording of a live training course we used to run, originally designed to span over two working days. It was converted into a webinar format in 2014. We have recently been uploading these classic recordings to Youtube, where they remain free to view.

2013 had the 20 millionth free Mascot search submitted at matrixscience.com. Again, this is in addition to the countless Mascot searches done on in-house systems. We don't collect statistics from in-house systems so I can't give a precise figure.

There were many major releases of our products as we continued to add and improve functionality. We added two more distributors, Cloud Scientific in mainland China and SMAnalytical in South Korea.

By 2017, Mascot had been cited by thousands and thousands of journal articles.

Finally, a few points of interest in the past five years. We released product versions 2.7 and 2.8, as well as several minor or patch releases. Version 2.7 added crosslinking support, which Sue Weintraub presented earlier, and version 2.8 had many improvements to core functionality like error tolerant searching. Label free quantitation in Distiller has been vastly improved; new Distiller quantitation reports implemented in Python; Quantitation summary report for Daemon; and so forth.

In 2019, we had the 25 millionth free Mascot search at matrixscience.com. Again, is in addition to all the other Mascot searches run on in-house systems.

Version 2.8 is currently the latest one. We are working hard on version 2.9, although the release date has not been set yet. However, now is an excellent time to update. All Mascot Server updates come with one year of Premium Support, which means you will get version 2.9 for free when it's released.

Timeline 2018-

- **Mascot is used for:**
  - routine research; high-throughput processing by core labs; industrial and pharmaceutical research; quality control; developing new proteomics methods; teaching proteomics; …
- **How to stay up to date:**
  - Subscribe to our newsletter
  - Follow us on Twitter, @Matrix_Science
  - LinkedIn, Matrix Science
  - Youtube, @matrixscience1998

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Today, Mascot is used for routine research, high-throughput processing by core labs, industrial and pharmaceutical research, quality control, developing new proteomics methods, teaching proteomics and many other areas.

If you'd like to stay up to date with Mascot developments, subscribe to our newsletter or follow us on social media.