New Approaches for Analysis of STN Data

STN Patent Forum
September 2005
Session Agenda

• Analysis and visualization overview

• STN tools for analysis and visualization
  – Online commands
  – STN Express® with Discover™, Version 8.0
  – STN® AnaVist™
Many critical questions can be answered by analysis and visualization

• **Competitive information**
  – What companies are working in this area?
  – How has their research changed over time?
  – What new areas of research are they patenting?
  – What are potential areas for licensing?
Many critical questions can be answered by analysis and visualization

- **Existing research and development**
  - What emerging technologies are being patented?
  - How can we expand current products into promising new areas of research?
  - What biological targets are currently being explored for a disease?

- **Unexplored areas for research**
  - What open areas exist for new development?
  - How to find the “accidental” discovery of great significance?
STN provides several tools to facilitate better understanding of answer sets

- **Traditional online commands**
  - ANALYZE
  - TABULATE

- **STN Express® with Discover!™, Version 8.0**
  - Analyze Plus with data grouping
  - R-group analysis for substance information

- Analysis & visualization with **STN® AnaVist™**
  - Search, data clean-up, and document linking
  - Interactive charts and research landscapes
Use the right tool for the question being asked

<table>
<thead>
<tr>
<th></th>
<th>Company Information</th>
<th>Patent Analysis</th>
<th>Substance Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>STN Express Analyze Wizards</td>
<td>Number of documents per parent company, over time</td>
<td>Key players and snapshot cross-tabulations</td>
<td>Substitution patterns on a core structure</td>
</tr>
<tr>
<td>STN AnaVist</td>
<td>Research focus, strategy, collaborations</td>
<td>Key players with research trends and emerging patent activity</td>
<td>Research trends and applications of substances</td>
</tr>
</tbody>
</table>
Classic search and retrieval is most effectively used to answer specific questions:

- What is the CAS Registry Number for DMSO?
- What patents exist for the regeneration of transition metal iron phosphate catalysts?
- Is a novel compound?
Traditional STN commands are available to extract display information

- **ANALYZE** extracts information from the display fields of a L-numbered answer set

```
=> ANALYZE L1 1- CS.ORG PA AU PRC PY.B
L2 ANALYZE L1 1- CS.ORG PA AU PRC PY.B : 13405 TERMS
```

- Extracted data is placed in a new L-number which includes for each term the:
  - Term number
  - Number of occurrences/documents
  - Percentage of documents
Display options include frequency of occurrence and individual fields

<table>
<thead>
<tr>
<th>TERM</th>
<th># OCC</th>
<th># DOC</th>
<th>% DOC</th>
<th>CS.ORG</th>
<th>PA</th>
<th>AU</th>
<th>PRC</th>
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<td></td>
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</tr>
</tbody>
</table>

Data must be manually edited if accurate statistics are desired.
**TABULATE** provides simple 2-dimensional visualization of trends

<table>
<thead>
<tr>
<th>TERM</th>
<th>DOC</th>
<th>% DOC</th>
<th>AU</th>
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<tr>
<td>1</td>
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<td>0.02</td>
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<td>2003</td>
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</tbody>
</table>

Trends may be difficult to discern when looking at columns of dates and numbers.
STN Express with
Discover!
Analysis Edition
Version 8.0
STN Express with Discover!, Version 8.0 provides tools for easier analysis

- Returning wizard
  - Analyze Wizard
- Enhanced wizards
  - Analyze Plus Wizard
  - R-group Analysis Wizard
- New wizard
  - CAS Registry Number® and Role Report Wizard
STN Express, Version 8.0, provides 2 Analyze Wizards for improved visualization

- **Analyze Wizard** provides automatic analysis, creation of spreadsheet, and 3D chart

- **Analyze Plus Wizard** provides everything that the Analyze Wizard does, as well as
  - Automatic **data grouping** of similar
    - Author/Inventor Name
    - Patent Assignee/Corporate Source
  - Manual grouping of other fields
  - Interactive co-occurrence matrix
STN Express, Version 8.0 provides improved data grouping tools

- **Ignore** option allows removal of selected terms from the final MS Excel spreadsheet
- **Data Group Editor** tool allows modification of selected terms that are saved in the custom grouping list
- Grouping may be manually adjusted to provide more accurate statistics and may be saved or shared
Both Analyze and Analyze Plus wizards are now available
Analyze and Analyze Plus wizards both provide 1 or 2 field analysis.
Both Analyze and Analyze Plus provide custom field selection and options.
The **Data Group Tool** in the Analyze Plus Wizard provides custom grouping.

To customize, select terms and click an option on the right.

Similar names are grouped automatically.

Click to save custom groupings for the future.
Select **Ignore** to remove terms prior to processing.

Ignore is useful for removing country names from patent assignee fields or “anonymous” from author names.
Edit Data Group File provides editing of saved custom groupings.
The **Analyze Wizard** provides spreadsheet and 3D chart...
The *Analyze Plus* wizard also creates an interactive cross-tab with links to STN.

Double-click in cells to retrieve documents meeting the cross-tab criteria.
STN Express 8.0 provides two wizards for analyzing substance information

- **R-group Analysis Wizard**
  - Identifies the largest common structure
  - Lists R-group substituents and attachments
  - Creates a table with desired fields and R-groups

- **CAS Registry Number and Role Report**
  - Identifies substances from records in CAplusSM
  - Selects all CAS RNs or only HIT CAS RNs
  - Creates an interactive cross-tab and 3D column chart
  - Provides links to references through the Display Wizard
Enhancements to *R-group Analysis Wizard* provide more flexibility

- Allows analysis of multicomponent substances
- Provides a preview of candidate substances
  - Select individual structures of interest
  - Select specific component of interest
  - Select specific R-groups of interest
The **R-group Analysis Wizard** analyzes multicomponent substances

The R-group Analysis Wizard
1) Saves R-group data
2) Creates a R-group Table

The save for R-group Analysis Wizard window shows:
- A warning that your answer set may contain substance types not suitable for use with the R-group Analysis Table Tool.
- A prompt to select the substance types to be **excluded** from the R-group file, then click Next.
- A list of substance classes to exclude:
  - Multicomponent substances
  - Alloys (recommended)
  - Coordination compounds (recommended)
  - Incompletely defined substances (recommended)
  - Manually registered substances (recommended)
  - Polymers (recommended)
  - Tabular inorganic substances (recommended)

Note: Excluding substance classes will result in additional search term charges. To prevent additional search term charges, uncheck all the options.
Select display fields to include in **R-group Analysis Table**

A cost estimate appears automatically before performing the request.
Save the R-group data for offline processing and logoff STN

Enter file name for R-group data.

Select all or range of answers to save.

IDE displays are automatically added to transcript file.

A confirmation message appears when all data is saved.
R-group Analysis Table Tool shows automatic preview of substances
Individual structures may be selected for R-group analysis.
Use the **Fields** tab to select display fields you want to include in table.

Highlight the fields of interest and click **Insert** for inclusion in the table.
The **R-group Analysis Table** identifies the R-groups on a common core structure.

<table>
<thead>
<tr>
<th>Row</th>
<th>CAS Registry Number®</th>
<th>Molecular Formula</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
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<td>2</td>
<td>497147-10-1 REGISTRY</td>
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<td></td>
<td>H</td>
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<td>H</td>
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<td>497147-08-7 REGISTRY</td>
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<td>H</td>
<td></td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

The final table may be saved as an .rtf file. The variable groups on the base structure are identified from R1 to R7.
CAS Registry Number & Role Report

Wizard may be used on a CAplus L#
All CAS RNs or only HIT CAS RNs may be extracted from the answers.
**CAS RN & Role Report Wizard** creates an interactive spreadsheet and 3D chart

Spreadsheet provides access to the **Display Wizard** and references from selected cells.
Any format is allowed in the **Display Wizard**

This display interaction is the same as displaying from an Analyze Plus co-occurrence chart.
Today, information professionals need the “big picture” view delivered by A&V to support strategic decision making

- Who has water purification technology I can potentially license?
- What are the trends in my competitor’s area of research?
- What are the potential applications of our patented compounds?
With STN AnaVist, you can visualize search results in a new way...
...to gain insights into and derive knowledge from large document sets

Relationships
STN® AnaVist™ provides advanced tools for collecting and efficiently analyzing answers from STN files.

- STN AnaVist automatically creates interactive visualizations that are linked dynamically.

- A group of interactive charts is created:
  - 1-dimensional Bar Chart
  - 2-dimensional Matrix Chart
  - Research Landscape
Document sets may be generated two ways

1. **Import from STN**
   - Save answer sets using STN Express, Version 8.0 from CAplus, PCTFULL, and USPATALL
   - Can also use H/Z versions of files
   - Search in MARPAT or CASREACT too!

2. **Search STN AnaVist**
   - Search CAplus, PCTFULL and USPATALL using the query builder
Data can be selected from 9 fields

- **Clustering Concepts** - text from document titles/abstracts
- **Technology Indicators** - CAplus Controlled Terms
- **Patent Classifications** - main and secondary IPC codes
- **Key Researchers** - selected from IN/AU fields
- **Key Organizations** - selected from PA/CS
- **Document Distribution** - patent/non-patent document types
- **Patent Organization** - national and international offices
- **Publication Year** - the basic patent year for CAplus
- **Priority Application Date** - earliest priority application date
Data is harmonized for improved analysis

- Data is cleaned and standardized
- Automatic grouping occurs for company and author names
  - Allows manual editing
  - Changes can be saved for future analysis
STN AnaVist provides the tools to do a complete competitive analysis

**Search Question:** Amgen has been on the forefront of developing promising new drugs. What new areas of research are they exploring? What are they currently patenting?
Steps for exploring a company’s current research

1. Create a company search using the Company Name (/CO) thesaurus in CAplus on STN
2. Use the Discover! Wizard in STN Express Version 8.0 to Save for STN AnaVist
3. Import results into STN AnaVist and start visualization
4. Examine charts as desired and refine by editing or grouping terms
5. Review documents, save, or print
Use the Company Name Thesaurus in CAplus for comprehensive results

```
=> FILE CAPLUS
=> E AMGEN/CO

<table>
<thead>
<tr>
<th>E#</th>
<th>FREQUENCY</th>
<th>AT</th>
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<td>--</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>E1</td>
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<td>AMGAS LIMITED/CO</td>
</tr>
<tr>
<td>E2</td>
<td>3</td>
<td></td>
<td>AMGEM INC/CO</td>
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<tr>
<td>E3</td>
<td>214</td>
<td>2</td>
<td>AMGEN/CO</td>
</tr>
<tr>
<td>E4</td>
<td>2</td>
<td></td>
<td>AMGEN AMGEN CENTER/CO</td>
</tr>
<tr>
<td>E5</td>
<td>1</td>
<td></td>
<td>AMGEN AND ONTARIO CANCER INSTITUTES/CO</td>
</tr>
<tr>
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<td>20</td>
<td>2</td>
<td>AMGEN BOULDER INC/CO</td>
</tr>
<tr>
<td>E7</td>
<td>1</td>
<td>2</td>
<td>AMGEN CAMBRIDGE RESEARCH CENTER/CO</td>
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<tr>
<td>E8</td>
<td>15</td>
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<td>9</td>
<td></td>
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<td></td>
<td>AMGEN CENTER/CO</td>
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<tr>
<td>E11</td>
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<td></td>
<td>AMGEN CENTER AMGEN INC/CO</td>
</tr>
<tr>
<td>E12</td>
<td>2</td>
<td></td>
<td>AMGEN COLORADO/CO</td>
</tr>
</tbody>
</table>

=> E E3+ALL

| E1 | 1342     | NAME | AMGEN INC/CO                        |
| E2 | 214       |     | AMGEN/CO                            |

*********** END ***********
```

Find the preferred name for Amgen.
Find name changes and other companies acquired by Amgen

=> E E1+ALL

E1  0 CNUM CAS1003414/CO
E2 1376 --> AMGEN INC/CO

NOTES
1980: AMGen established
1981: AMGen changed company name to Applied Molecular Genetics, Inc.
1983: Applied Molecular Genetics, Inc. changed name to Amgen
1994: Amgen acquired Synergen Inc.
2000: Amgen acquired Kinetix Pharmaceuticals
2002: Amgen acquired Immunex Corp.

E3  215 RT1 AMGEN/CO
E4  20  RT1 AMGEN BOULDER INC/CO
E5  15  RT1 AMGEN CANADA INC/CO
E6  4   RT1 APPLIED MOLECULAR GENETICS INC/CO
E7  422 RT1 IMMUNEX CORP/CO
E8  337 RT2 IMMUNEX CORPORATION/CO
E9  7   RT1 KINETIX PHARMACEUTICALS INC/CO
E10 1  RT1 SYNERGEN A G/CO
E11 1  RT1 SYNERGEN AG/CO
E12 2  RT1 SYNERGEN ASSOCIATES INC/CO
E13 4  RT1 SYNERGEN BIOLOGICALS INC/CO
E14 104 RT1 SYNERGEN INC/CO

********** END **********
Search company name variations and **Save for STN AnaVist** using STN Express 8.0

```plaintext
=> S E2+ALL
L2  2505 "AMGEN INC"+ALL/CO  (14 TERMS)
```

A search using the company name thesaurus counts as only one search term charge.
Import saved answer set from STN

Saved answer sets are assigned the Results Key eXchange (.rkx) extension.
The Import Summary shows document titles and a summary by Publication Year, Document Type, and Priority Application Year.
STN AnaVist provides immediate answers

**Researcher by PY Matrix Chart:** Determine key authors.

**Document Window:** Go directly to specific areas of focus.

**Key Organizations Bar Chart:** Instantly see important players.

**Research Landscape:** See a complete picture of a company or research area.
The Research Landscape identifies research fronts

Select an area of interest: Highlighted dots represent documents containing desired concepts.

One area of research is interleukin receptors.
The Research Landscape can be focused or tilted for easier visualization of peaks.

Place the mouse over a peak to see list of additional concepts.
The Research Landscape is created from clustering concepts

• Clustering concepts are identified by examining terms extracted from the title and abstract
  – Terms are standardized and trimmed
  – Plurals and synonyms are consolidated
• Clustering concepts are mapped
  – Coordinates are calculated so nearness reflects similarity
  – Density of documents in 2-dimensional space creates research fronts, depicted as peaks
• Relatively high peaks are labeled with the most frequently occurring concepts
Cluster concepts can be edited

![Image of Term Editor: Clustering Concepts window]

- Terms: escherichia, escherichia coli
- Documents: 192

Options available in the window:
- Group
- Ungroup
- Include
- Exclude
- Ungroup All

Apply groupings to future results.
A bar chart for Publication Year Trends

Charts can be sorted by document count or label.

The highlighted areas of the bars show the number of documents relating to interleukin receptors for a given year.
A matrix chart for Researchers by Publication Year

Review at a glance the key researchers for a particular company (Amgen) in a research area of interest (interleukin receptors).
View the number of highlighted documents versus total documents

Rows and columns can be sorted.
Bibliographic information is shown for highlighted documents

Flagged answers may be saved or printed.

Flag answers of interest.

Click on title to see bibliography and abstract.
Additional charts can be created to explore trends in patent filings.

Chart can be sorted alphabetically.

Compare patent classification codes with priority application date information to quickly determine patent trends.
More recent PRAI can indicate new research directions

<table>
<thead>
<tr>
<th>Patent Classifications by Priority Application Dates</th>
<th>© 2005 ACS on STN</th>
</tr>
</thead>
<tbody>
<tr>
<td>A61K = Preparations for medical, dental, or toilet purposes.</td>
<td></td>
</tr>
<tr>
<td>C12N = Micro-organisms or enzymes; compositions thereof.</td>
<td></td>
</tr>
</tbody>
</table>

Right-click on the patent classification codes to access the definitions.
Some recent Amgen patent activity

• The A61K patents deal with angiopoietin-2 in the treatment of angiogenesis-related diseases

• The C12N patent covers MPL receptor-binding thrombopoietin mimetic peptides and related compounds for treatment of thrombocytopenia
Searches can be developed directly in STN AnaVist

**Search Question:** Identify key organizations researching aldose reductase inhibitors used for diabetes. What technologies are currently being investigated?
Use the query builder within STN AnaVist to create answer sets.
Filters are available to refine by Publication Year, Document Type, and Priority Application Year.

Filters can also be used on answers sets imported from STN.

After filtering, click **Start Visualization**.
Identify Key Organizations

Key Organizations display by frequency. The chart can also be sorted alphabetically.

Right-click to Edit Terms.
Key Organization terms can be edited for more accurate analysis

- Names may be manually grouped or ungrouped
- Groupings may be saved for future searches
- Names may be excluded
Select concepts to explore further on the Research Landscape

Contour lines may be added to map.
Selected area is highlighted in all other charts

Right-click to Drill Down on a Bar.
Highlighted documents associated with Wyeth can be viewed in Drill Down.

Click on a title to see details.
A document can be targeted to show its position on the Research Landscape.
Technology Indicators by Clustering Concepts compares controlled versus free-text. The technology indicators are derived from CAplus controlled vocabulary.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Rat</th>
<th>Prevent</th>
<th>Grow</th>
<th>Sorbitol</th>
<th>Nerve</th>
<th>Glucose</th>
<th>Pathway</th>
<th>Polyol</th>
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Obtain documents containing the substances of interest with the desired property.
Obtain details on highlighted answers

Options are available to move forwards/backwards, Save, Print, get full-text, or locate document.
Summary

• STN tools are available to better analyze, visualize, and understand search results

• **Online -- ANALYZE and TABULATE**
  – Provides simple analysis and 2 field displays
  – Limited grouping, harmonization, and data clean-up
  – Most useful for simple occurrence analysis and trend analysis of a smaller number of terms
Summary

• **STN Express, Version 8.0**
  – Data grouping for authors and companies
  – Improved visualization with automatic charts and spreadsheets
  – Cross-tab provides interactive links to documents
  – Most useful for visualization of trends for a moderate number of terms
Summary

• **STN AnaVist** is the only analysis and visualization tool that provides *interactive, dynamic* charts and landscapes
  – Analysis and visualization of large answer sets
  – Multiple charts that interact dynamically

• STN AnaVist is the only tool designed to harness the power of **CAplus** data

• STN AnaVist is the only tool that combines data mining of controlled terminology with text mining of unstructured data
New Approaches for Analysis of STN Data

STN Patent Forum
September 2005