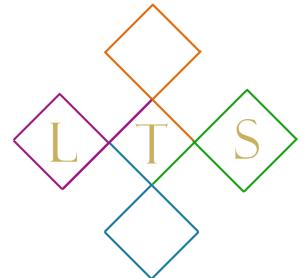
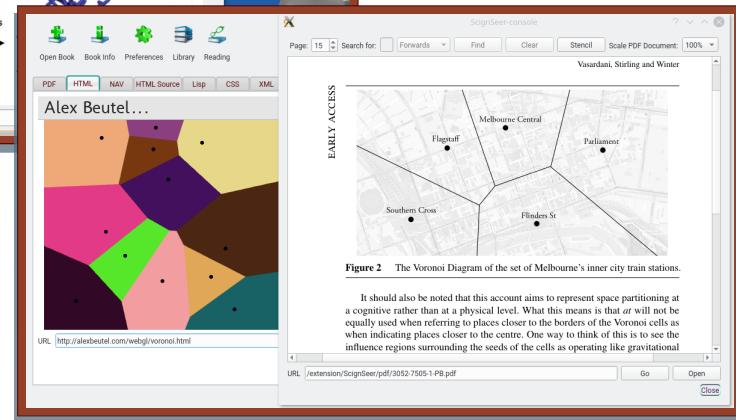
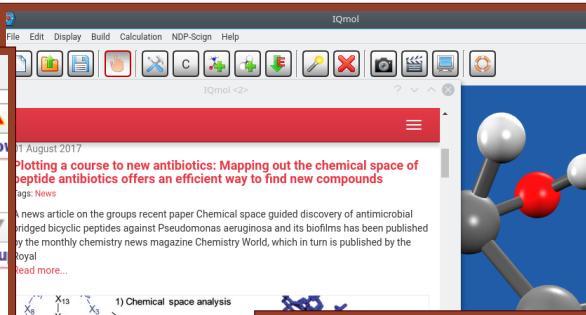
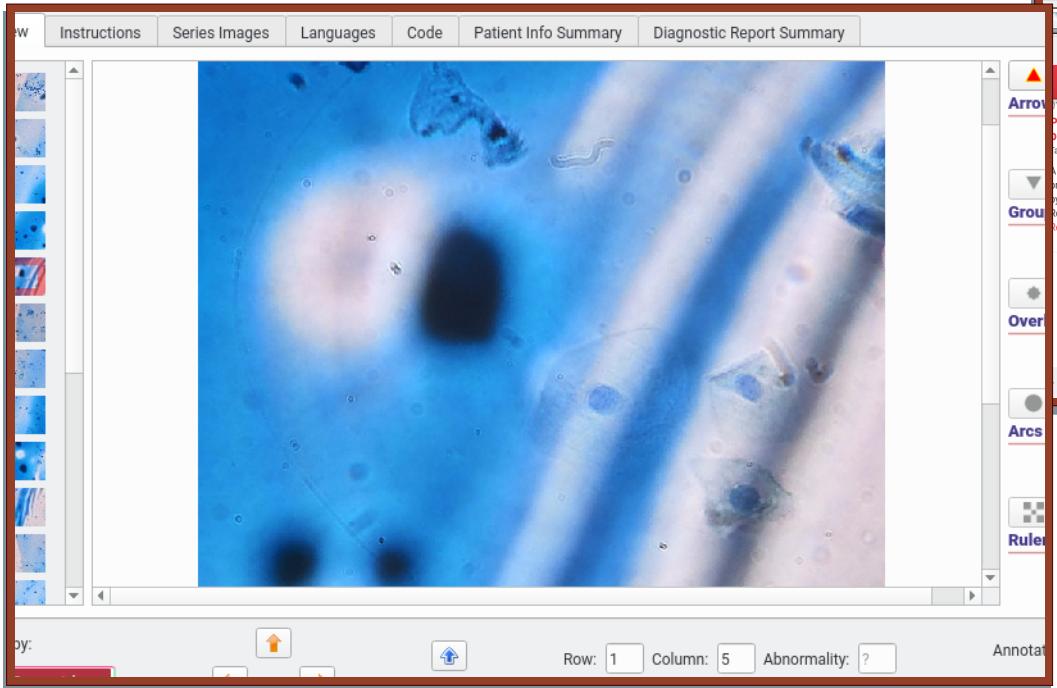


Dataset Creator ("dsC")



Linguistic Technology Systems (LTS)
Amy Neustein, Ph.D., Founder and CEO
amy.neustein@verizon.net
(917) 817-2184

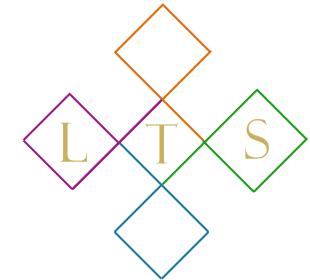
Linguistic Technology Systems



Dataset Creator and Dataset Applications

Dataset Creator Defined

- Dataset Creator is a collection of code libraries and project templates which allow authors and publishers to create interactive software customized for individual research data sets.
- With Dataset Creator, code and data can be unified into a Research Object bundle providing a self-contained “Dataset Application” for responsive, desktop-style exploration of each published data set (see slides 4-21 for Dataset Application case-studies and screenshots).



Features of Dataset Applications

Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, and so on:

- Readers (and scientists seeking to replicate research findings) can navigate through data sets with GUI controls optimized for the structure and parameters of each dataset, synced with research publications (books, articles, and machine-readable manuscripts).
- Use dsC to build innovative data-collection instruments alongside interactive Research Object applications, providing useful software at each stage of the research process.

Linguistic Technology Systems



Group 1: Features of Dataset Applications

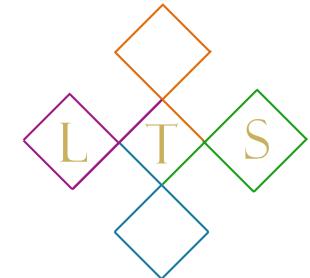
User Interface Features Typical of Dataset Applications

The code for each dsC data set includes a customized “Dataset Application” which displays individual samples and groups of samples via 2D, 3D, and native-compiled GUI controls. Each Dataset Application can thereby make use of advanced visual and interactive features that are uniquely possible when using customized, native-compiled GUI classes. The following screenshots will show several examples of these features, including:

Specialized Top-Level Controls Tree Widgets, Stacked Widgets, and Graphics Scenes.

Context Menus Systematically organize functionality around UI layouts.

Multi-Window Displays Divide application functionality in multiple specialized top-level windows and/or dialog boxes.



Linguistic Technology Systems



Initial Application Window

[Customize Build](#)[Activate TCP](#)[Screenshot](#)

Main Flow Temperature Oxygen

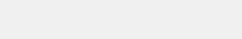
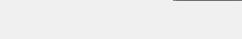
Index	Flow	Time With / Average	Time Against / Delta	Temperature C° / K°	Oxygen (calculated)
► 1	0.561	0.000219893	0.000220329	49.60	
▲ 2	1.17	0.000219764	0.000220614	49.70	
		0.000220189	8.49999e-7	322.15	93
	%	0.106536		67.3623	1
	#	159		322	394
► 3	5.133	0.000218866	0.000221751	49.70	
► 4				48.90	
► 5				49.50	
► 6				49.60	

In addition, nested rows can display supplemental information, such as data values' rank (3) and percentage (2) (on the scale of the least to greatest value) relative to all other values for each statistical parameter.

Sample Up/Down Peer Up/Down

First

Peer First



DOUBLE

Using a "tree widget" (a two-layer spreadsheet), instead of a conventional spreadsheet, allows the Dataset Application to distinguish primary values (those measured directly by physical devices and experimental equipment) from intermediate values calculated via algorithms.

Graphics

2D 25x25 2D 12x12 2D 3x3 2D 37x75

3D 25x25 3D 12x12 3D 3x3 3D 37x75

Interacting with the Main Window

Customize Build Activate TCP Screenshot

Main	Flow	Temperature	Oxygen		
Index	Flow	Time With / Average	Time Against / Delta	Temperature C° / K°	Oxygen (calculated)
▼ 33	0.589	0.00022861 0.000228828	0.000229046 4.35997e-7	5.40 278.15 7.25373 0 1	80 34
%	0.0531...				
#	111				
► 34	1.098	0.000228924	0.000229746	5.40	
► 39	4.988	0.000228814	0.000231814	5.40	
► 35	5.044	0.000227894	0.000230985	5.40	
► 37	0.554	0.000229983	0.00023039	5.50	
► 38	1.057	0.000229819	0.000230657	5.50	
► 31	5.057	0.000229433	0.000232403	5.50	
► 30	1.108	0.000230476	0.000231223	5.70	
► 29	0.184	0.000230511	0.000230934	5.80	

1 About/ Show in Document (may require XPDF)
Copy Column to Clipboard (values)
Copy Column to Clipboard (ranks)

2

3

4

Sample Up/Down

Peer Up/Down

First

Peer First

Graphics

2D 25x25

2D 12x12

2D 3x3

2D 37x75

3D 37x75

* Minimize

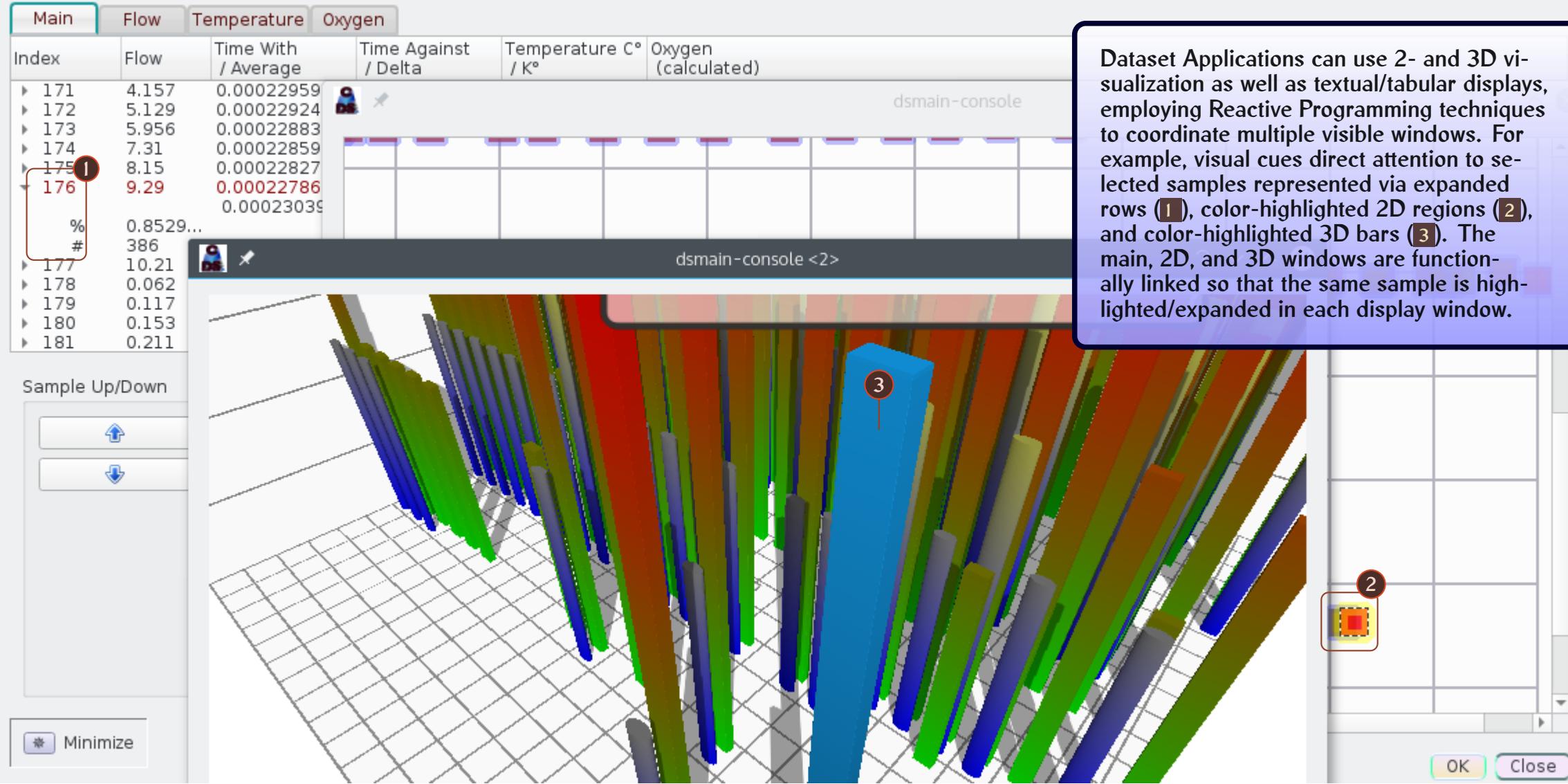
OK Proceed Close

Despite being implemented as a tree widget instead of a two-dimensional spreadsheet, the primary window for this Dataset Application has many spreadsheet-like features, such as copying columns of data (1) and sorting columns by switching notebook tabs (2); each notebook page shows the data sorted on a specific parameter.

Two different sets of navigation buttons enable the user to scroll through samples according to the currently selected sort parameter (3), or according to the primary index (4).

Coordinated Data Visualization

Customize Build Activate TCP Screenshot



Interacting with the Visuals

Customize Build Activate TCP Screenshot

Main Flow Temperature Oxygen

Index	Flow	Time With / Average	Time Against / Delta	Temperature C° / K°	Oxygen (calculated)
171	4.157	0.00022959			
172	5.129	0.00022924			
173	5.956	0.00022883			
174	7.31	0.00022859			
175	8.15	0.00022827			
176	9.29	0.00022786			
		0.00023039			
%	0.8529...				
#	386				
177	10.21	0.00022762			
178	0.062	0.00022844			
179	0.117	0.00022852			
180	0.153	0.00022852			
181	0.211	0.00022905			

dsmain-console

Dataset Applications make extensive use of context menus to organize functionality and provide advanced interactivity. In this screenshot a context menu action (1) has been selected which alters the 2D display, visually emphasizing a restricted set of data points (2) and contracting all others (3).

OK Close

Getting Information About Modeling Parameters

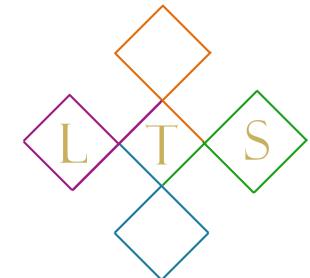
Using Dataset Applications as Pedagogical Tools

In addition to interactive visualization, Dataset Applications are useful tools for understanding experimental protocols and research methods. Within Dataset Applications, modeling units such as statistical parameters and record fields are visible *in situ* within a GUI — identified by labels, buttons, and other interactive micro-controls. As a result, users encounter modeling elements in a structured visual-interactive context. To learn more about modeling elements, Dataset Applications are equipped with several pedagogical features shown on the following screenshots:

“About” Dialogs Brief summaries of research terms and parameters.

XPDF Links Links back to research articles read in an embedded PDF viewer.

XPDF Enhancements The XPDF viewer can be customized for each data set and included with dataset code, with extra features to integrate article or book texts with Dataset Applications.



Linguistic Technology Systems



Obtaining Information About Parameters

[Customize Build](#)[Activate TCP](#)[Screenshot](#)

Main	Flow	Temperature	Oxygen
Index	Flow	Time With / Average	Time / Delta
▶ 33	0.589	0.00022861	0.00022861
▼ 34	1.098	0.000228924	0.000228924
%		0.000229335	8.22%
#	154		
▶ 39	4.988		
▶ 35	5.044		
▶ 37	0.554		
▶ 38	1.057		
▶ 31	5.057		
▶ 30	1.108		
◀ 29	0.481		

Sample Up/Down



Context menus also allow users to obtain information and explanations about individual parts of the data set, such as individual statistical parameters. In this screenshot, the user has right-clicked on a data column (Flow) and has chosen a context menu action which shows, via a dialog box, a precis of the quantities represented in that column and their significance for the data set as a whole.

Flow of Oxygenated Air

Click 'Show Details' for a summary or 'More' for PDF/Original Article links.

More (PDF) ... Cancel Hide Details...

The Flow measurements calculate the flow of oxygenated air (as needed for Continuous Positive Airway Pressure (CPAP) devices) given inputs of ambient temperature and sound time travel. The third (nested) row beneath the Flow value shows each sample's Flow 'rank' (where lower ranks mean that a sample has less Flow; the rank #1 is the sample with least flow). The second nested value shows each sample's flow measurement as a fraction of the maximum measurement

Minimize

OK

Proceed

Close

Embedding XPDF

[Customize Build](#)[Activate TCP](#)[Screenshot](#)

The screenshot shows the XPDF viewer interface. At the top, there's a toolbar with various icons. Below it is a menu bar with 'File' and 'Edit'. A status bar at the bottom displays the path '/home/nlevisrael/sci...' and page information '2 of 21'. The main content area shows a page from a Wiley Expert Systems publication. A red box highlights a specific text block:

because we know that air is a relatively fixed mixture of gases, primarily consisting of nitrogen, oxygen, argon, and carbon dioxide, that in varying amounts of water vapour or humidity. The speed of sound in air is approximately 343 m/s at room temperature (20 °C or 70 °F). This is primarily a function of temperature; the only other factor that has any significant influence is relative humidity. However, humidity has only a slight influence; an increase in relative humidity by only a small amount of 0.5%, we can conclude that the speed of sound is lower at higher altitudes. This is because the temperature and relative humidity are inversely proportional. The air pressure is lower at higher altitudes. The speed of sound travels slower at lower pressures.

An annotation box with a red border and a white background is overlaid on the text. It contains the following text:

In this example, after viewing a short description of a particular data field inside the Dataset Application, researchers have the option of studying that parameter further by reading at the location in the original publication where the field is introduced or described. The XPDF viewer is compiled as an embedded application within the main Dataset Application and can itself be customized for each data set.

Testing and Fine-Tuning Dataset Applications

Tools for Editors and Developers

Although ordinary users can explore and visualize dsC data sets “Out of the Box”, advanced users have many options for customizing their build of the application in terms of their specific roles and available 3rd-party libraries. These fine-tuning possibilities include:

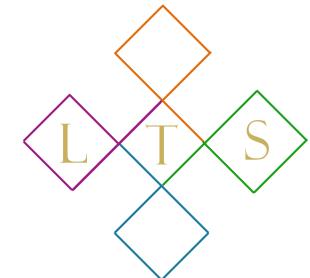
Test Suites Tools for creating and/or running test suites to ensure that the Dataset Application works across platforms.

Data Export Tools for reusing data in other projects.

External Libraries Some features like XPDF and 3D graphics require libraries that cannot be published with the data set in source code form. Advanced users can select which of these libraries to incorporate into their version of the Dataset Application.

Scripting Data sets can compile their own scripting environment to automate testing and manipulation of research data.

Networking Dataset Applications can use an embedded TCP server to communicate with other applications, enabling multi-application workflows (this is also how testing is implemented).



Linguistic Technology Systems



Configuring the Data Set Application

The screenshot shows the Qt Creator Dataset Creator configuration dialog. On the left, the 'Operating System Profile' section is set to 'Linux (Generic)' with '64 Bit' selected. The 'Compile Options' section contains several checkboxes: 'Use 3d graphics', 'Use Kauvir/Phaon and TCP (for tests)', 'Use XPDF' (checked), 'Qt PNG/FreeType libraries' (unchecked), 'System PNG/FreeType libraries' (checked), 'Build KDMI Components and Console (for data export)' (unchecked), 'Build Research Object Information Console' (checked), 'Build External XPDF Application' (checked), and 'Preview (right click "Administrator" to enable/disable)' (unchecked). A 'Reset' button is present. The 'Select User Role' section includes checkboxes for 'User, Reader, Researcher (Default)', 'Author' (checked), 'Editor', 'Tester', and 'Administrator'. A button at the bottom says 'Click To Set Compiler Options Based On User Role'. At the bottom are 'OK', 'Proceed', and 'Cancel' buttons. On the right, the 'Customize Build' tab is selected, showing the 'Oxygen (calculated)' status. Other tabs include 'Activate TCP' and 'Screenshot'. A callout box points to the 'Customize Build' tab with the number 1. Another callout box points to the 'Select User Role' section with the number 2.

Using Qt Creator, the Dataset Creator will automatically launch the main Dataset Application with every feature needed in order to visualize and explore the data. In addition, the data set includes several configurations allowing users to incorporate more specialized or complex features, such as XPDF, test suites, and data export code. Users can fine-tune which additional features they wish to utilize — via a separate dialog box (1 and 2) — to create a customized build of the main Dataset Application and supplemental executables.

The Dataset Creator also recognizes distinct "roles" (2), including general readers, authors, those who double-check the main Dataset Application via a test suite, and those who design the test suite and write dataset code overall (dubbed "Administrators").

Testing the Data Set Application

Dataset Creator includes a sophisticated framework for building and running test suites to ensure that raw data is processed correctly and that User Interface components work properly on different Operating System platforms. This includes a separate testing application that sends instructions to the main Dataset Application via TCP (1).

The testing application has several features to facilitate running tests, including options to repeat tests, mark success or failure (2), and examine the system clipboard (3).

Customize Build Activate TCP (1) Screenshot (3)

Test Returned

Test Copy Temperature Ranks: Pass or Fail?

Pass Fail Hide Details...

Note: For tests which involve values copied to the system clipboard, you can use the text area below as a scratch pad to examine the clipboard contents.

Clipboard Content:

318
322
323
284
317

OK Proceed Close

Copy Temperature Ranks: This test should result in the Temperature ranks (sorted by index) being copied to the system clipboard, which can be verified by pasting the clipboard into a blank file and comparing the lines (there should be one sample per line) to the Temperature column as viewed in the tree table dialog.

Testers can also read a description of each test (4), and view the scripts used to create them.

OK

Features of Dataset Applications for Books

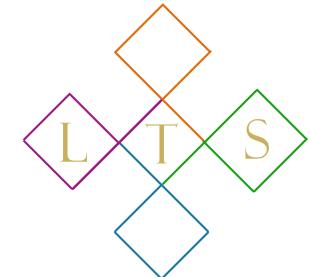
Datasets Compiled From Book Examples

The remaining screenshots demonstrate how data sets can be used even outside of a lab context generating experiment data. The pictured data set represents a corpus of linguistic examples mined from Wiley's *Blackwell Handbook of Pragmatics*. Creating data sets from book-length publications can encompass several steps:

Text Mining In the case of linguistics, this involves locating example sentences within linguistics texts and storing them as an independent corpus.

Canonical Formatting If possible, linguistics texts should be annotated so that extracting examples can be automated.

Annotation Linguistic corpuses are often annotated to identify structural details, beyond raw text, in each sample.



Linguistic Technology Systems



Creating a Data Set from a Book



This screenshot shows a linguistics dataset that illustrates several advanced interactive features made possible by the Dataset Creator's Qt-based front-end technology. Useful features include context menus embedded with drop-down selections (1) and button/checkbox groups for filtered scrolling through a list of samples (2 and 3).

Filter Forms Filter Issues

Text Dialog
 Intonation Paragraph

Ambiguity Context Logic Scope
 Polarity Belief Convention Idioms

Activate TCP <select>
Customize Cancel

I have received the e-mail. ?Nevertheless it's in Dutch.

Text

► She'll be better off in a new place.
► I have received the e-mail, but it's in Dutch.
▼ I have received the e-mail. ?Nevertheless it's in Dutch.
 I have received the e-mail. ?Nevertheless it's in Dutch.
▼ Her husband is in hospital. Yet she's seeing other men.
 Her husband is in hospital. Yet she's seeing other men.
► Her husband is in hospital and she's seeing other men.
► Her husband is in hospital. But she's seeing other men.
► Her husband is in hospital. Nevertheless she's seeing other men.
► Oscar knocked the vase and it broke.
► Did Oscar break the vase?

Form Jump to Chapter

Text 22 (N_A) 257
Text 22 257
Text 23 (N_A) 257
Text 23 257
Text 24 (N_A) 257
Text 25 (N_A) 257
Text 26 (N_A) 257
Text 27 (N_A) 260
Dialog 28 (N_A) 260

First Auto Expand
ON

OK Process

Filtered Up/Down Examples Up/Down Peer Up/Down Chapter Start/End Chapter Up/Down

Minimize

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Interacting with Data Samples

Filter Forms

Text
 Inton

Filter Issues

Logic
 Scope
 Convention
 Idioms

The linguistic samples comprising this data set are all example sentences, phrases, or dialog-snippets that are used, in the *Blackwell Handbook of Pragmatics*, as expository samples for case-studies of various linguistic phenomenon and pragmatics, semantics, and grammatical theories.

Activate TCP Screenshot
Customize Build

Show Original

's in Dutch.

OFF

Text

- ▶ She was never really happy here. So she's leaving.
- ▶ She'll be better off in a new place.
- ▶ I have received the e-mail,
- ▶ I have received the e-mail.
 - I have received the e-mail.
- ▶ Her husband is in hospital.
- ▶ Her husband is in hospital
- ▶ Her husband is in hospital.
- ▶ Her husband is in hospital.
- ▶ Oscar knocked the vase ar
- ▶ Did Oscar break the vase?

Show in Document (requires XPDF)

Copy Text to Clipboard

Launch Triple-Link Dialog with Text

Copy Samples to Clipboard

Highlight (scroll from here)

Form	#	Issue	Page	Chapter
Text	19	(N_A)	256	10
Dialog	20	(N_A)	256	10
Text	21	(N_A)	257	10
Text	22	(N_A)	257	10
	22		257	10
Text	23	(N_A)	257	10
Text	24	(N_A)	257	10
Text	25	(N_A)	257	10
Text	26	(N_A)	257	10
Text	27	(N_A)	260	10
Dialog	28	(N_A)	260	10

Filtered Up/Down



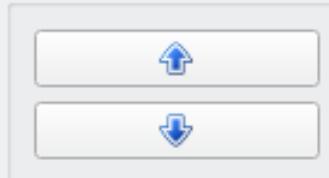
Examples Up/Down



Peer Up/Down



Chapter Start/End



Chapter Up/Down



First



Auto Expand
ON

Minimize

OK

Proceed

Close

Linking Back to the Book

Filter Forms Filter Issues

Text Dialog
 Intonation Paragraph
 Ambiguity Context
 Polarity Belief

In France, Watergate wouldn't have done Nixon any harm.

Text

- ▶ On the table.
- ▶ Every bottle is empty.
- ▶ She seized the knife and stabbed her husband.
- ▶ The Boston Marathon will take place next week. Max thought
- ▶ My friends were under the impression that I was running a
- ▶ Sue believes Luke has a child and that Luke's child will visit
- ▶ In France, Watergate wouldn't have done Nixon any harm.
 In France, Watergate wouldn't have done Nixon any harm
- ▶ In France, Watergate wouldn't have done Nixon any harm
- ▶ The crook paid them with fake money.
- ▶ The crook thought he was paying them with fake money, b
- ▶ We do not know much about this part of the brain, which p

Filtered Up/Down Examples Up/Down Peer Up/Down

XpdfReader: /home/nlevisrael/scign/HP/ar/cpp/about/about-files/main.pdf

File Edit View Window Help

690 / 867 | ← → | - + | 113% | find |

from the matched spaces to create a **blended mental space** with emergent structure. This creates a conceptual integration network of the form shown in figure 29.4. The generic space represents the structure shared by the inputs. The square in the blended space stands here for the emergent structure which arises in the blending.

After browsing through the data set, users can link back to the original text to see the current author's discussion of particular examples.

So, for example, one way to understand the counterfactual in (6):

(6) In France, Watergate wouldn't have done Nixon any harm.

is to build a conceptual integration network that partially matches two input spaces with prominent aspects of the American political system and the French political system, respectively, and develops an emergent blended space

15. The Pragmatics o...
16. Pragmatics of La...
17. Constraints on Ell...
▼ III Pragmatics and its Int...
18. Some Interaction...
19. Pragmatics and A...
20. Pragmatics and S...
21. Pragmatics and t...
22. Pragmatics and t...
23. Pragmatics and I...
24. Historical Pragma...
25. Pragmatics and L...
26. Pragmatics and C...
▼ IV Pragmatics and Cogni...
27. Relevance Theory
28. Relevance Theory...
29. Pragmatics and C...
30. Pragmatic Aspect...
31. The Pragmatics o...
32. Abduction in Nat...
Bibliography
Index

Generic space

Input I₁

Input I₂

Blend

Figure 29.4 Diagram showing conceptual blending

A Linguistics Annotation System

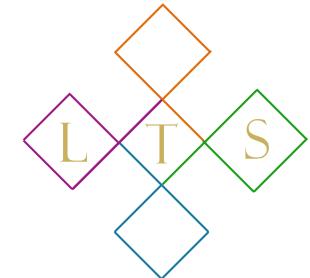
Tools to Facilitate Annotating Linguistic Corpora

The final three screenshots show an example of how a custom-signed application can facilitate the task of building an annotated corpus from a linguistics text. The components demonstrated here enable several strategies (which can be combined) for describing parsing structures and the logical composition of language samples:

S-Expressions Representing linguistic units as semantic and syntactic transformations triggered by words assigned to “functional” types.

Dependency Grammar Representing phrase structures via inter-word syntactic relationships.

Link Grammar Representing linguistic structure via connectors internal to each word-sense. Inter-word links are activated when each word in the pair has a connector compatible with the other word's connector. Intuitively, a connector represents how one word's meaning or grammatical contribution can be “completed” by linking to a separate word.



Linguistic Technology Systems



Building Parsing Models

The main Dataset Application for the demo Linguistics data set includes a distinct window for building annotations on language examples. Features of this component include an entry area for building S-Expression models of sentences with visual cues such as parenthesis-matching color highlights (1) and sidebars where users can add inter-word annotations using relations drawn from Link Grammar and CoNLL-U Dependency Grammar (2).

OK Proceed Cancel

Pivot	Ig:Source Expectation	Ig:Target Expectation	Ig: Description	dg:Source Expectation	dg:Ta Expect

Filter Issues

She has invited at least Sarah and James.

Add (Pair/Triple) Reset

SXPR Mode

Clear <- (()) -> Copy Read Splice Back Splice

(has invited) !

Link Grammar (Completion Layer)

AAA	AF	AJ	AL	AM	AN	AZ	B	BI	BT
BW	C	CC	CO	CP	CQ	CV	CX	D	DD
DG	DP	DT	E	EA	EB	EC	EE	EF	EI
EL	EN	EP	EQ	ER	EW	EZ	FL	FM	G
GN	H	HA	I	ID	IN	IV	J	JG	J
Q	JT	K	L	LE	LI	M	MF	MG	MJ
MV	MX	N	NA	ND	NF	NI	NJ	NM	NN
NO	NR	NS	NT	NW	O	OD	OF	ON	OT
OX	P	PF	PH	PP	Q	QI	QJ	QU	R
RJ	RS	RW	S	SF	SFI	SI	SJ	SX	SXI
TA	TD	TH	TI	TM	TO	TQ	TR	TS	TT
TW	TY	TZ	U	UN	V	VC	VJ	W	WN
WR	WV	X	XI	Y	YP	YS	Z	ZZZ	

Using Dock Widgets For Flexible Layout

The list of link/dependency relations is also isolated as a “dock widget” that may be dragged to float above the other application windows (1), or “docked” at different positions (left or right) on its parent window. This screenshot also shows a dialog box used for a precis of the individual CoNLL-U (Conference on Natural Language Learning - Universal) and Link Grammar relations (2).

This screenshot illustrates the use of dock widgets for flexible application layout. On the left, there's a vertical stack of docked windows: 'Filter Forms' (with 'Text' and 'Intonation' checked), 'Text' (listing sentences like 'We do not know'), 'SXPP Mode', and 'Filtered Up/Down'. A large central window is titled 'dsmain-console <2>' and contains a table of dependency relations. A floating dock window, labeled 'Dependency Grammar (Refinement)', is shown above the main console window. This dock window has a title bar, a list of dependency types, and a detailed description of 'nsubj: nominal subject'. It includes buttons for 'Ok', 'Hide Details...', and 'Minimize'. The 'Minimize' button on the dock window is highlighted with a red circle and a callout. Another red circle with a callout points to the 'Minimize' button on the dock window itself. The overall interface is designed for dynamic window management and information retrieval.

Link and Dependency Grammar Annotations

dsmain-console <2>

Filter Forms

Text Intonation

She has invited at least Sarah and James

Add at least Reset

SXPR Mode

Clear <- (((->)) -> Copy Read Splice Back Splice

Pivot Ig:Source Expectation Ig:Target Expectation Ig: Description dg:Source Expectation

0 {0}	has invited			
1 {1}	invited She			
2 {2}	Sarah James			
3 {3}	at least			

Users can select word-pairs from samples being annotated and then identify the relationship between the selected words, as understood according to Link or Dependency Grammars. The list of link/dependency relations provides an interface to research and read overviews about the relationships.

Dependency Grammar (Refinement Layer)

acl advcl advmod amod
appos aux case cc
ccomp clf compound conj
cop csubj dep det
discourse dislocated expl fixed
flat goeswith iobj list
mark nmod nsubj nummod
obj Show Info han parataxis
punct Unmark vocative
xcomp Auto Insert

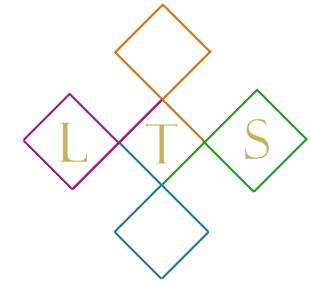
OK Proceed Cancel

Minimize

Minimize

Technological Components of Dataset Creator

- ◆ **A3R (Application-as-a-Resource):** A3R Applications are self-contained, citable resources and tools which can conform to modern resource documentation standards, such as the Research Object protocol. Dataset Applications can use A3R tools and the A3R protocol to create custom desktop-style applications for viewing and analyzing research data, while bundling the dataset and application code into a citable Research Object.
- ◆ **HTXN (Hypergraph Text Encoding Protocol):** HTXN is a protocol for encoding documents' character streams and document structure via "standoff annotation" (i.e., character encoding is fully separate from structural representation). HTXN supports diverse kinds of document models, including L^AT_EX, XML, RDF, and Concurrent Markup.
- ◆ **MOSAIC (Multiparadigm Ontologies for Scientific and Academic Publishing):** Mosaic provides data-modeling capabilities which reflect a diversity of Information Representation paradigms, such as Hypergraphs, Conceptual Spaces, and Object-Oriented Simulation. Mosaic includes the Mosaic/HTXN Semantic Document InfoSet and Mosaic Plugin Framework (see below).



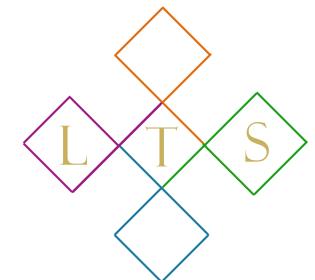
Linguistic Technology Systems



A3R Document Viewers

A3R applications may embed viewers for document formats such as e-Pub, HTML, and PDF; then supplement conventional publications with special components customized for individual manuscripts: e.g. (as in this case), a widget allowing readers to visually explore patterns in classical Indian music.

The screenshot shows a digital journal interface for 'ANTHROPOLOGY AND HUMANISM'. At the top, there are icons for preferences, library, and reading, followed by tabs for HTML Source, Lisp, CSS, and XML. Below this is a red banner with the text 'Read article view'. On the left, there's a sidebar with a search bar and a logo. The main content area features the journal title 'ANTHROPOLOGY AND HUMANISM' and a link 'Explore this journal >'. Below the title is an article summary: 'Ethnographer as Apprentice: Embodying musical Knowledge in South India' by 'Laura Weidman' published on '26 December 2012' with a link to 'Full publication history'. A central feature is a 'Tala Types' viewer window. It has a dropdown menu 'Display Tala Types: Jhoomra/Dhamar (14 beats)'. Below it is a grid diagram with red and purple boxes. A horizontal slider labeled 'Patterns' shows 'Pattern 1 (3-4-3-4)' on the left and 'Pattern 2' on the right. Below the slider is a file path 'File /extension/ScignSeer/articles/svg/tala.svg'. At the bottom of the viewer window are 'OK' and 'Proceed' buttons. To the right of the viewer is publication information: 'Volume 37, Issue 2 December 2012 Pages 214-235' and a thumbnail of the journal cover.

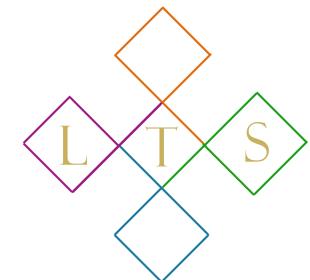
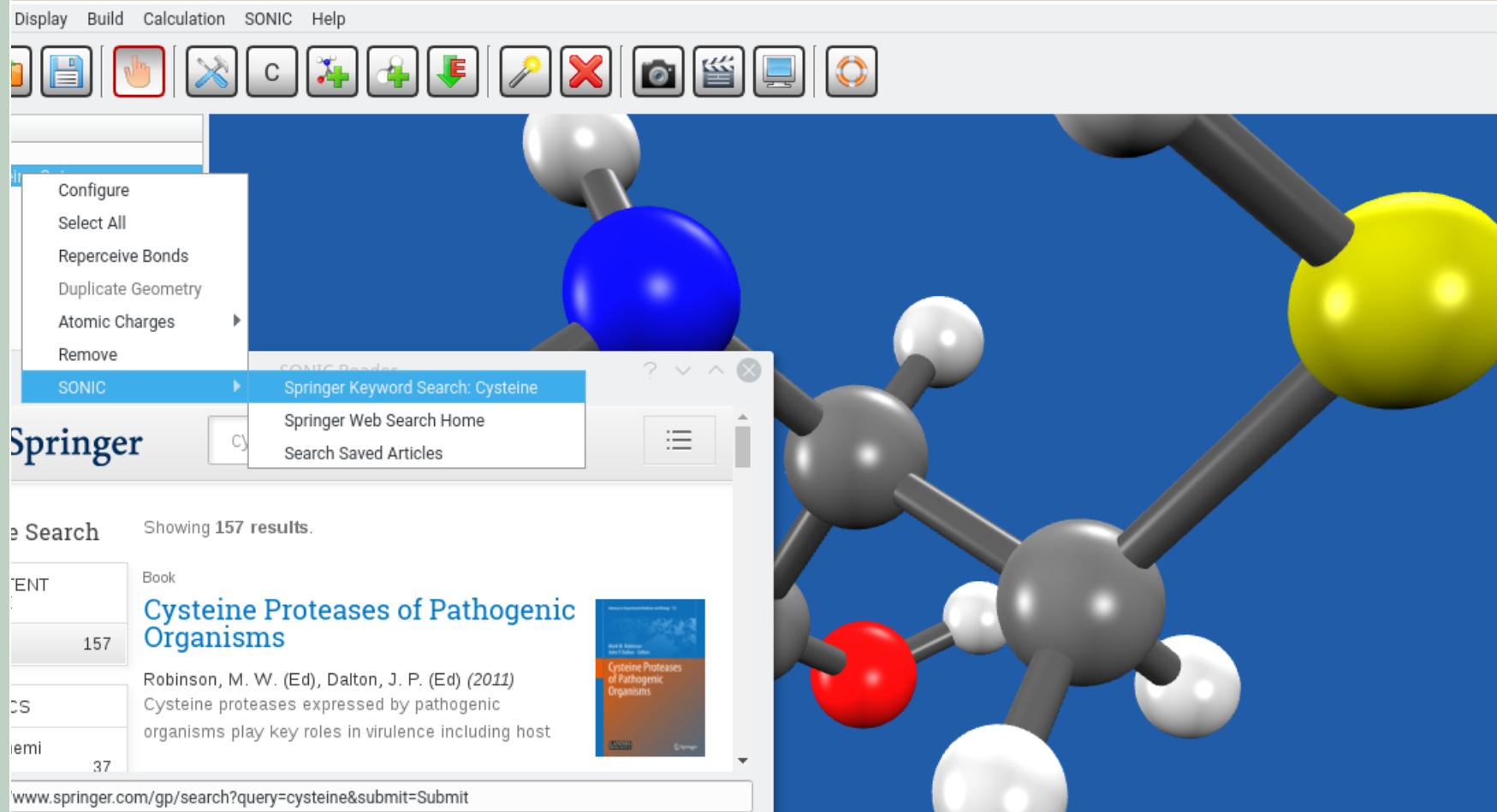


Linguistic Technology Systems



A3R Document Viewers as Embedded Components

Document Viewers may also be embedded in host applications which provide domain-specific visualization capabilities. For example, chemistry papers might be viewed within IQmol (a Qt-based program for molecular visualization and physical/chemical analysis) via an A3R document-viewer plugin.

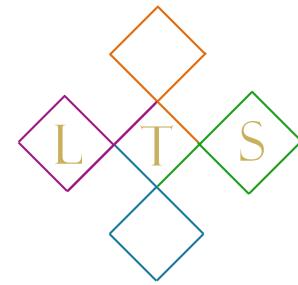


Linguistic Technology Systems



Document Viewers Augmented With APIs

Another strategy for interactive publications is linking documents with APIs maintained by publishers, or by cultural or educational institutions.



The screenshot shows a digital document viewer interface. At the top, there's a navigation bar with 'View' and 'Instructions' buttons, and two buttons on the right labeled 'API' and 'Open Folder'. On the left, there's a vertical sidebar with several small thumbnail images of different objects. The main content area features a large image of a bronze relief sculpture of a profile face. Overlaid on this image is a red-bordered callout box containing the text: "As an example, documents mentioning artifacts held in a museum can provide features to view more information about those museum-pieces through the host institution's API." To the right of the image, there's a detailed description of the object:

MEDAL

Click the icon to save this object

This is a **MEDAL**. We acquired it in **1920**. Its me is a part of the **Product Design and Decorativ** department.

Cite this object as

Medal; bronze; 1920-31-1

At the bottom of the interface, there are buttons for navigating between pages, and input fields for 'Row:' (0), 'Column:' (0), and a search bar.

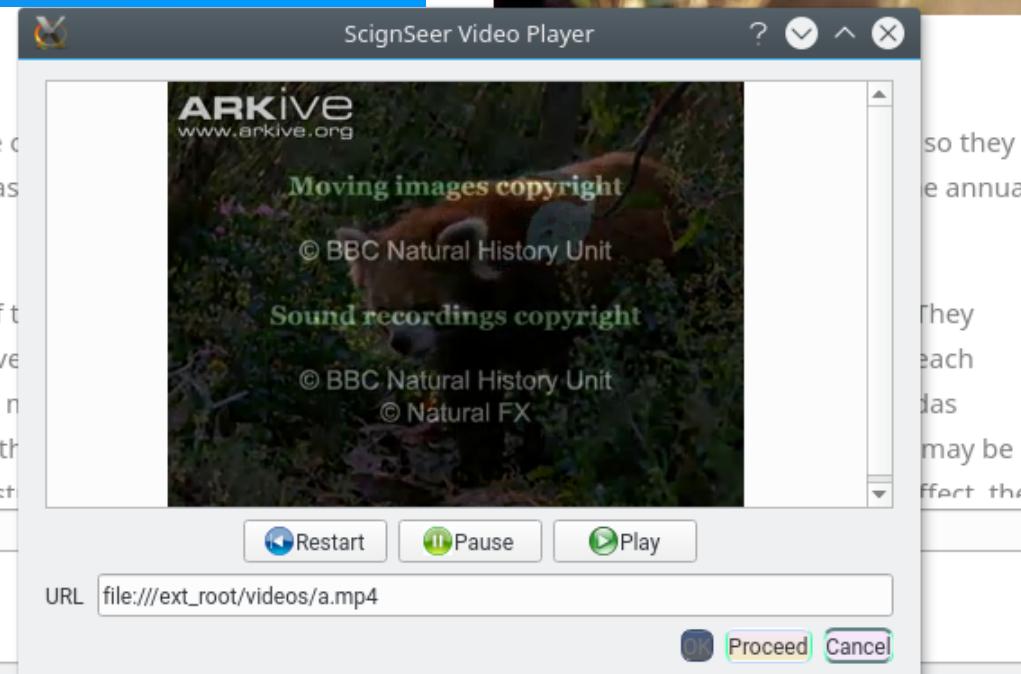
Embedded Multimedia

Custom-built A3R document viewers can provide convenient access to multimedia content embedded in or linked to texts — including audio files, videos, and 3D graphics scenes or models.

Allurus fulgens styani (also known as *a. f. refulgens*). Only found in China (in the Hengduan

Mo
My
The
ab

In this case a video player is launched in a dialog box, floating above the article text. For those reading digital books or articles, videos and other multimedia content can be presented through secondary windows launched via context menus; text and multimedia may thereby be viewed side-by-side.



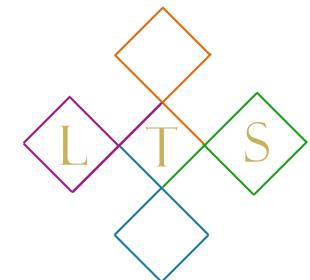
Behavior

Red pandas are generally solitary, but there are a couple of cases where they develop extended associations with their mothers that last throughout the breeding season.



In terms of territoriality, red pandas tend to have overlapping home ranges with other. This means that they may search for the same food sources, particularly during the breeding season.

arkive.org/red_panda/about-the-red-panda/

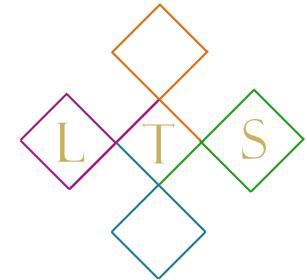


Linguistic Technology Systems



Components of Mosaic

- ◆ **Mosaic/HTXN Semantic Document Infoset (MH-SDI):** The Mosaic/HTXN Infoset is similar to an XML Infoset, embodying a machine-readable representation of documents' text, structure, and secondary resources which can be accessed according to different protocols (such as a Document Object Model). In contrast to XML, the MH-SDI supports more detailed semantic queries against document structures, such as identifying sentence boundaries and matching multimedia assets to manuscript locations.
- ◆ **Mosaic Plugin Framework (MPF):** The Mosaic Plugin Framework is a protocol for embedding plugins or extensions within document viewers, scientific applications, and multimedia software, with the plugins interoperating to implement multi-application networks. In particular, document viewers can launch and send data to scientific or multimedia applications so that readers can access multimedia content embedded in publications.

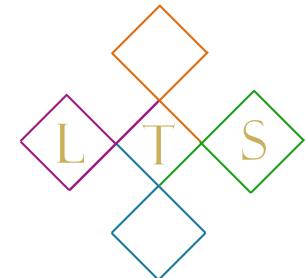


Linguistic Technology Systems



MOSAIC as an Alternative to Semantic Web Ontologies

Many experts have critiqued the Semantic Web for lacking conceptual rigor, adequate modeling for multi-scale information, and intrinsic representations for software requirements. To address these limitations, MOSAIC alternative Semantic Web paradigms with the following features:



Inter-Application Networking Protocol

- Interoperability is achieved by applications sharing modular and mostly autonomous code libraries that implement data models via strong typing, with (de)serialization and network/request logic implemented at the type level.
- A hypergraph-based type theory presents an overarching type-theoretic data-modeling frameworks which subsumes the type systems of most programming languages.

Multiscale, Requirements-Focused Resource Description

- Hypergraph-based Resource Framework to intrinsically support multi-scale data structures.
- Workflow-oriented “Meta-Procedure” Interface Definition framework to enforce procedural alignment among applications.
- The Mosaic networking and Resource Description protocols can be concretely implemented via the Mosaic Plugin Framework (see the following slides).

Linguistic Technology Systems



The Mosaic Plugin Framework (MPF)

MPF allows document viewers to communicate with external software, including Dataset Applications.

File Edit View Window Help | **Mosaic**

11 / 55 | ← → | - + | 125% | find | ...

/home/nlevisrael/hypergr/ntxh/ar/

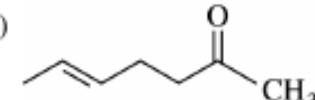
This slide and the next shows interop between a publication viewer (XPDF) and IQmol (a molecular visualization program). In this scenario, a student is reading practice questions for a GRE Chemistry exam. With proper supplemental data, an e-reader with MPF plugins (here XPDF) can launch a chemistry application (here IQmol) at relevant locations in the text, such as where questions involve the structure of specific molecules.

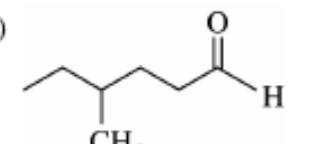
outline

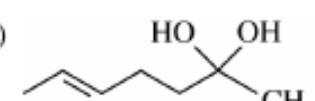
Table of Contents

- Overview
- Test Content
- Preparing for the Test
- Test-Taking Strategies
- What Your Scores Mean
- Taking the Practice Test
- Scoring the Practice Test
- Evaluating Your Perform...
- Practice Test
- Worksheet for Scoring th...
- Score Conversion Table
- Answer Sheet

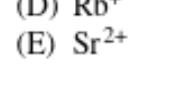
1. Which of the following is the major product of the reaction shown above?

(A) 

(B) 

(C) 

(D) 

(E) 

4. The molecular geometry of thionyl chloride, SOCl_2 , is best described as

(A) trigonal planar

(B) T-shaped

(C) tetrahedral

(D) trigonal pyramidal

(E) linear

e⁻

M ————— e⁻ ————— N

Copy "thionyl chloride"

3D thionyl chloride Viewer (launch IQmol)

Application Interop via MPF

MPF allows document viewers to communicate with external software, including Dataset Applications.

File Edit Display Build Calculation Help | Mosaic

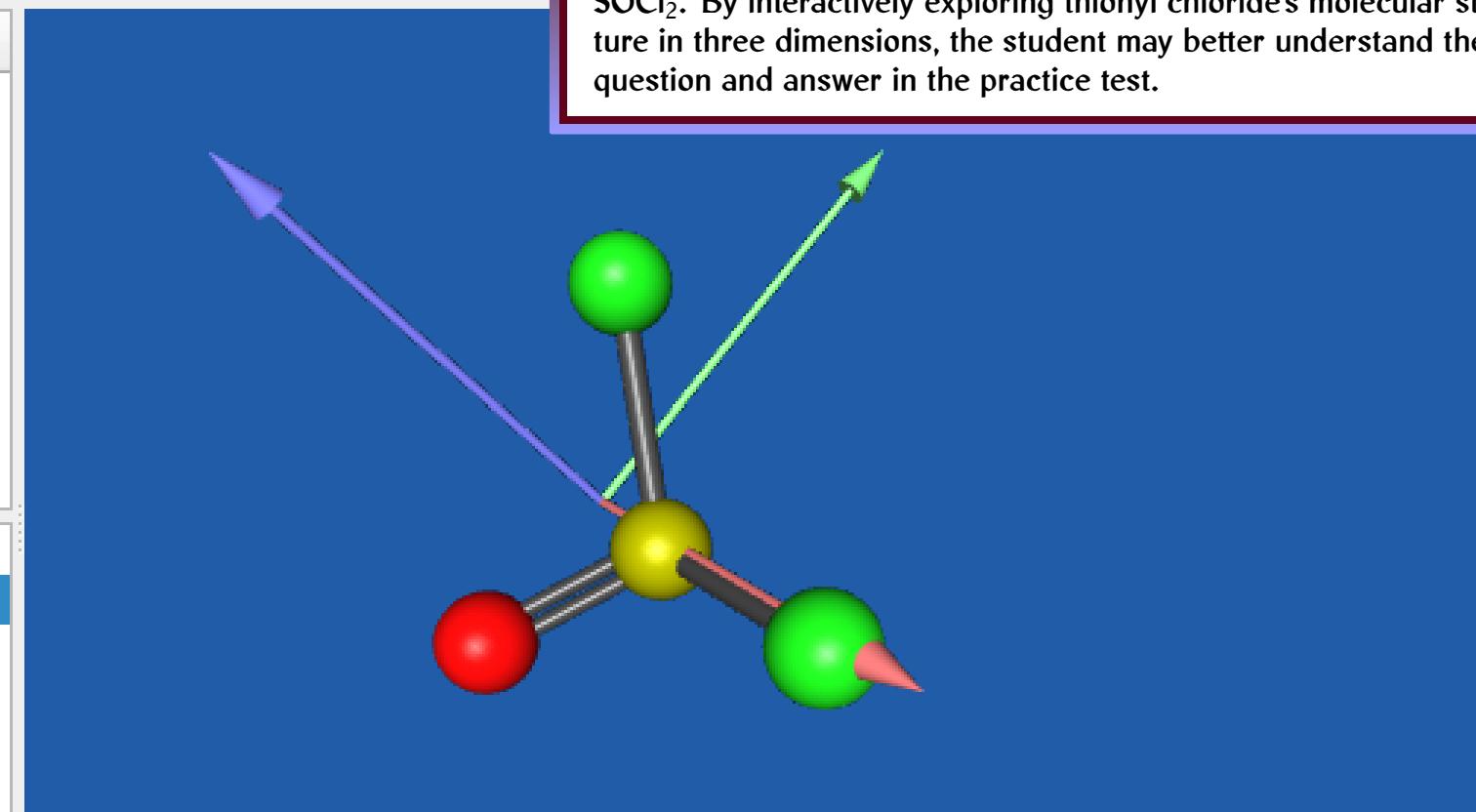


Model View

- ▶ Global
- ▶ 7719-09-7

History:

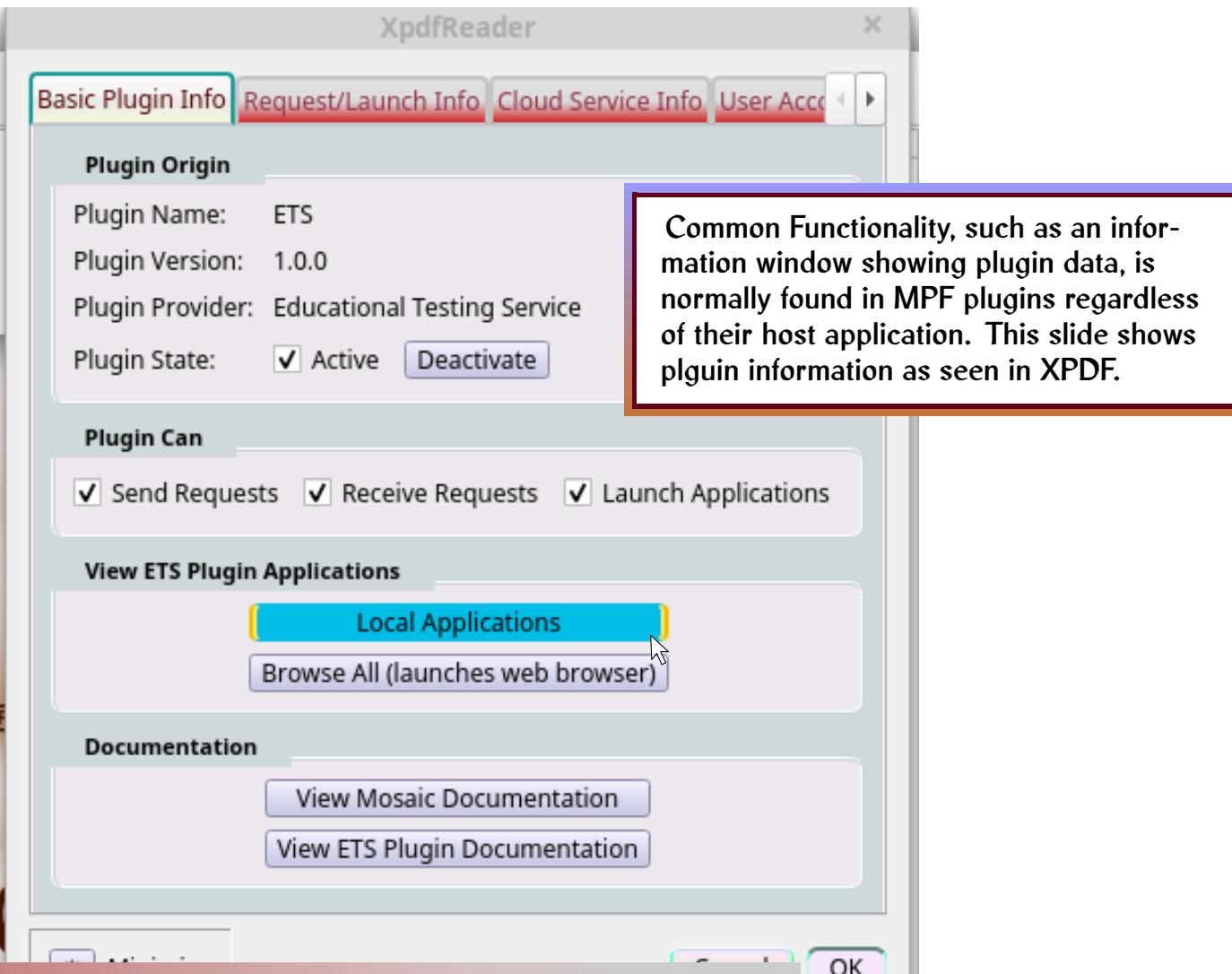
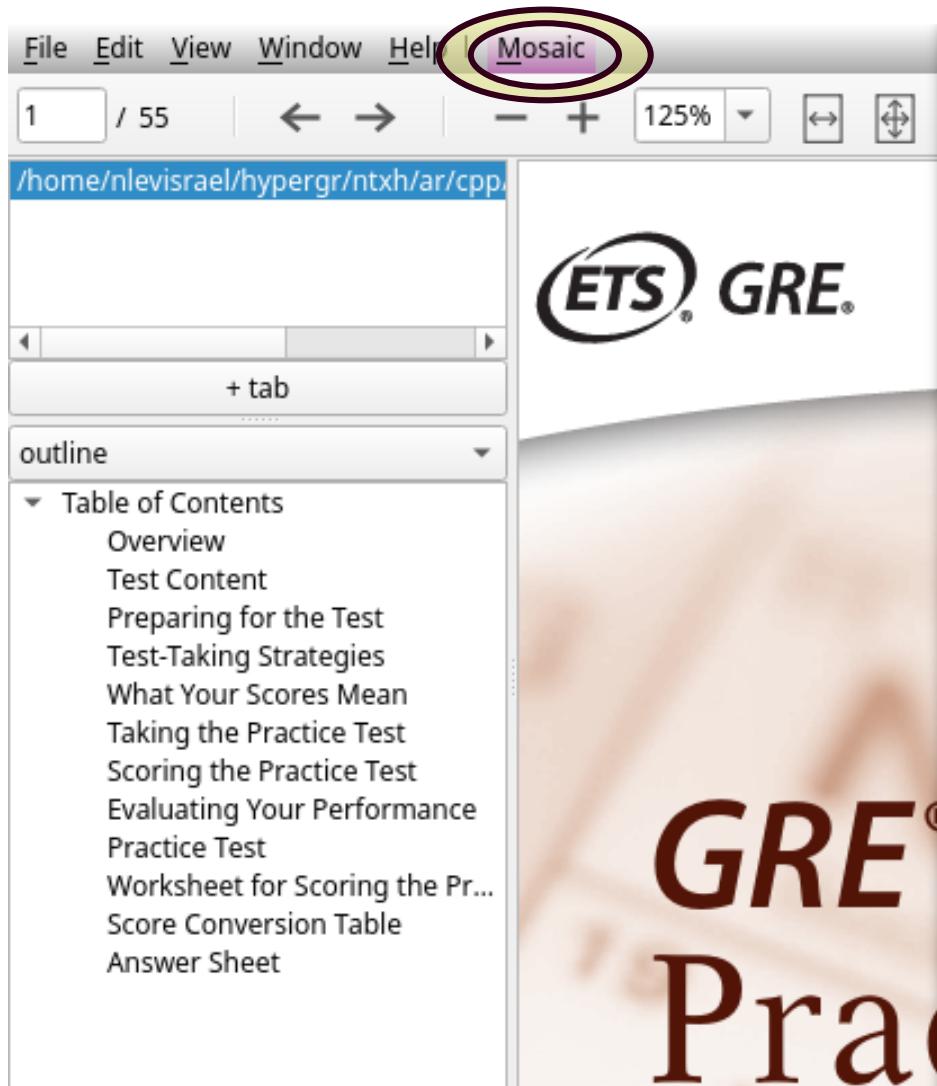
New molecule



IQmol has received data from the student reading a question about thionyl chloride (SOCl_2) and has loaded a Molecular Data file for SOCl_2 . By interactively exploring thionyl chloride's molecular structure in three dimensions, the student may better understand the question and answer in the practice test.

Common Plugin Functionality

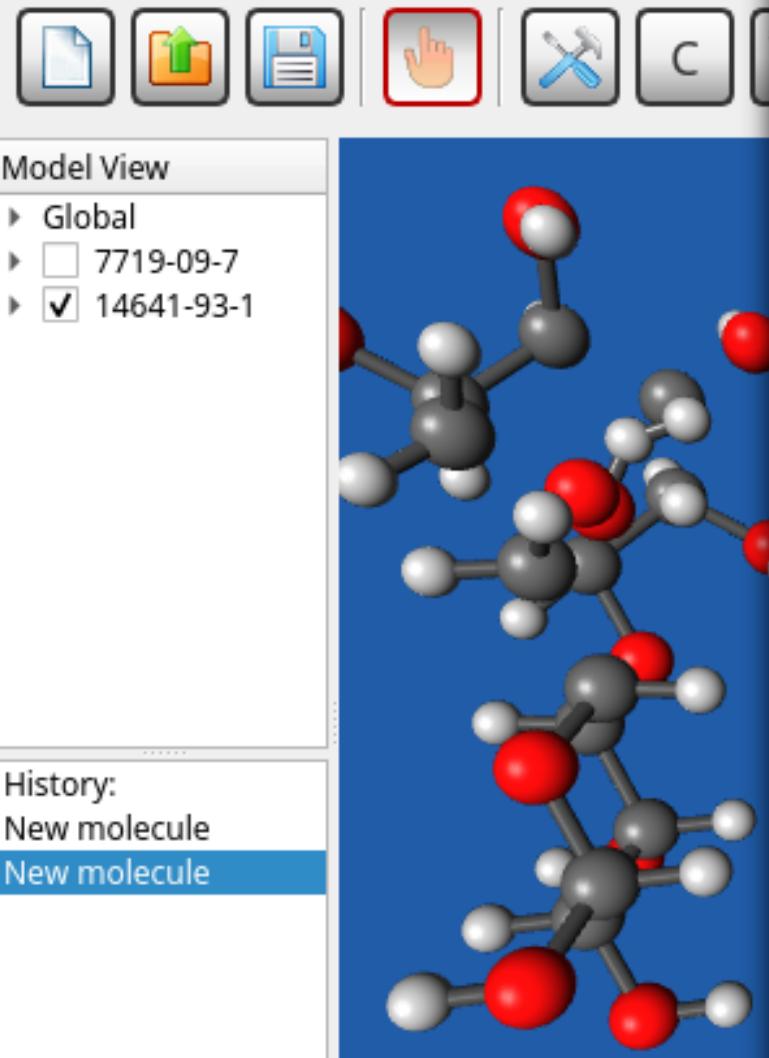
MPF Plugins have similar functionality and features in different host applications, which makes it convenient to use as readers switch among multiple applications.



MPF Request Info

Common MPF functionality includes showing information about data sent between applications.

File Edit Display Build Calculation Help | Mosaic



IQmol

Basic Plugin Info Request/Launch Info Cloud Service Info User Accou

Application Info

Source Application Name: XpdfReader
Source Application Path: /home/.../xpdf-console
Target Application Name: IQmol
Target Application Path: /home/.../IQmol

Request Info

Request Resource Description: Lactose (3D View)
Request Resource Type: Molecular Data File
Request Resource File: 14641-93-1.mol
Request Format: NTXH [View Request Details](#)

Launch Info

TimeStamp: Sun Mar 1 11:12:46 2020
Launch/Request Info: Not Applicable

This slide shows another dimension of functionality common to disparate MPF plugins: the ability to examine inter-application request information. The “request info” tab on a “plugin info” dialog documents the origin and details of the most recent inter-application request which triggered the plugin to respond (in this case, instructions to load a specific Molecular Data file).

MPF Tracking User and Session Data

Plugins can store user-specific application state.

File Edit View Window Help | Mosaic

37 / 55 | ← → | - + | 125% | find | ...

/home/nlevisrael/hypergr/ntxh/ar/cpp/pract

+ tab

outline

Table of Contents

- Overview
- Test Content
- Preparing for the Test
- Test-Taking Strategies
- What Your Scores Mean
- Taking the Practice Test
- Scoring the Practice Test
- Evaluating Your Performance
- Practice Test
- Worksheet for Scoring the Practice...
- Score Conversion Table
- Answer Sheet

Copy "lactose"

3D lactose Viewer (launch IQmol)

The image shows the chemical structure of lactose, a disaccharide consisting of two glucose units linked by a beta-1,4-glycosidic bond. The structure is shown in its chair conformation. The left glucose unit has its anomeric carbon (C1) in a beta configuration, while the right glucose unit has its anomeric carbon (C1') in an alpha configuration. Hydroxyl groups (OH) are labeled at various positions: C1-OH, C2-OH, C3-OH, C4-OH, C5-OH, and C6-OH. Hydrogen atoms (H) are also indicated at each carbon atom.

95. Which of the following is NOT true about the disaccharide lactose shown above?

- (A) Lactose is a reducing sugar.
- (B) Lactose undergoes mutarotation.
- (C) Lactose is optically active.
- (D) Lactose can be hydrolyzed to monosaccharides with $\text{H}_2\text{O}/\text{H}_2\text{SO}_4$.
- (E) Lactose has a 1,1'- α -glycosidic linkage.

AAK ALL I II

97. A peptide digest yields the following fragments listed above. The three fragments are separated using capillary electrophoresis, with the time at which each peptide fragment reaches the detector being proportional to its net charge. Which of the following lists the fragments in the order, from first to last, in which they reach the detector? (A = glycine; K = lysine)

- (A) I, II, III
- (B) I, III, II
- (C) II, I, III
- (D) II, III, I
- (E) III, II, I

98. In fluorescence spectroscopy, (Φ_f) is best defined as the

$\text{H}_3\text{N}^+ \text{---} \text{C}(=\text{O}) \text{---} \text{NH} \text{---} \text{C}(=\text{O}) \text{---} \text{NH} \text{---} \text{C}(=\text{O}) \text{---} \text{CH}_2\text{CO}^-$

Plugins can remember previous interactions between applications and can send detailed information packages — inter-application networking is not limited to sending single multimedia files. In this slide a student is seen launching IQmol from a later question in the GRE practice test ...

Reloading User Sessions

After being launched a second time, the MPF plugin can reload the prior application state.

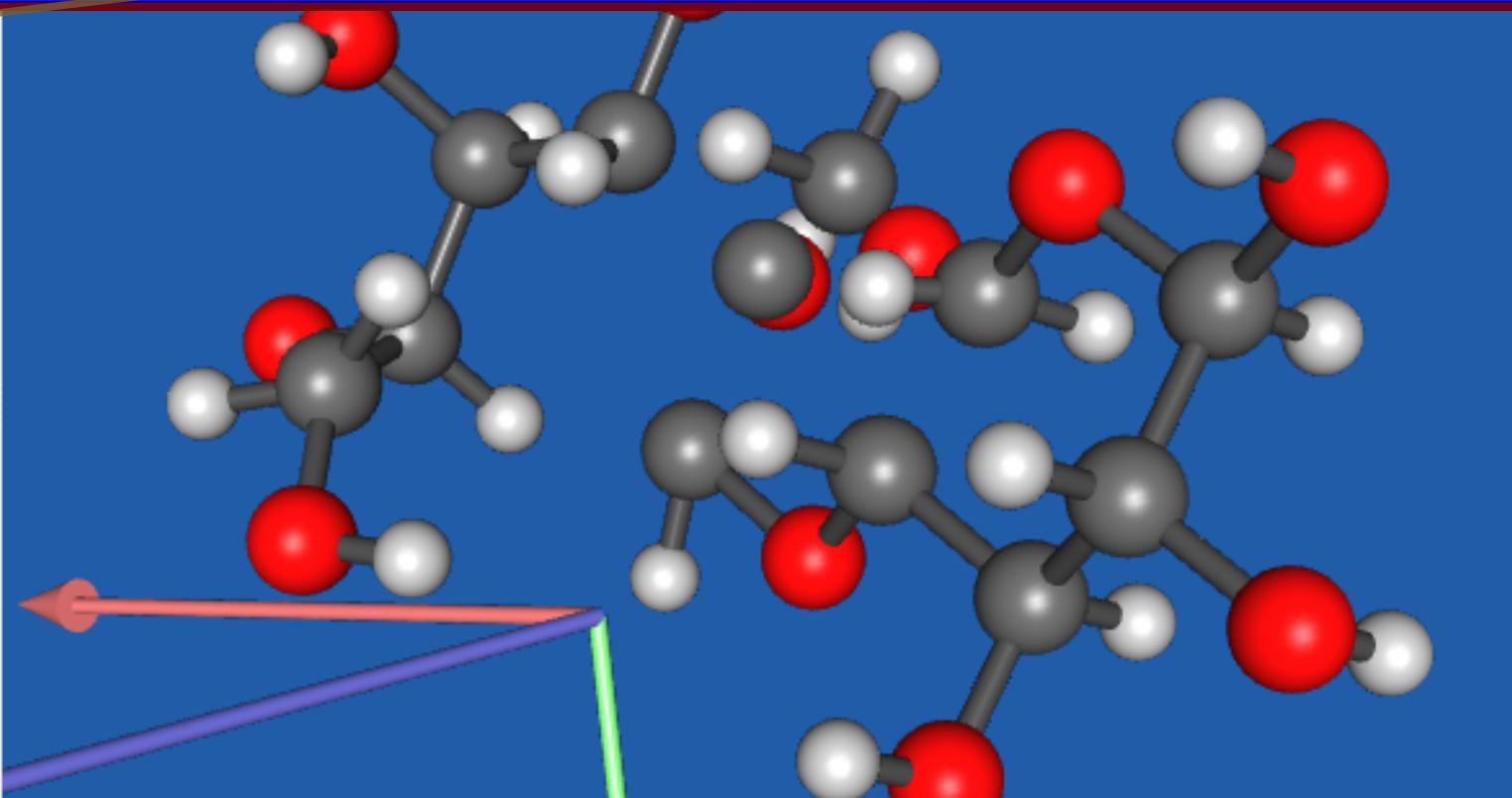
File Edit Display Build Calculation Help | Mosaic



Model View

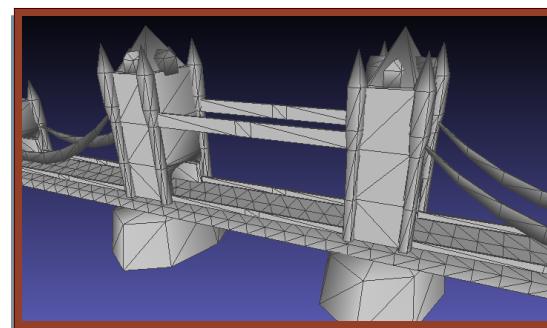
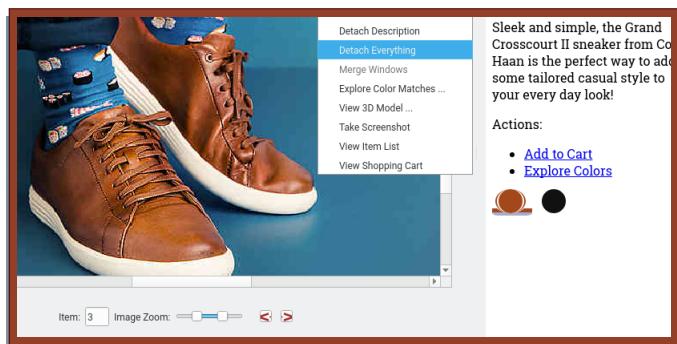
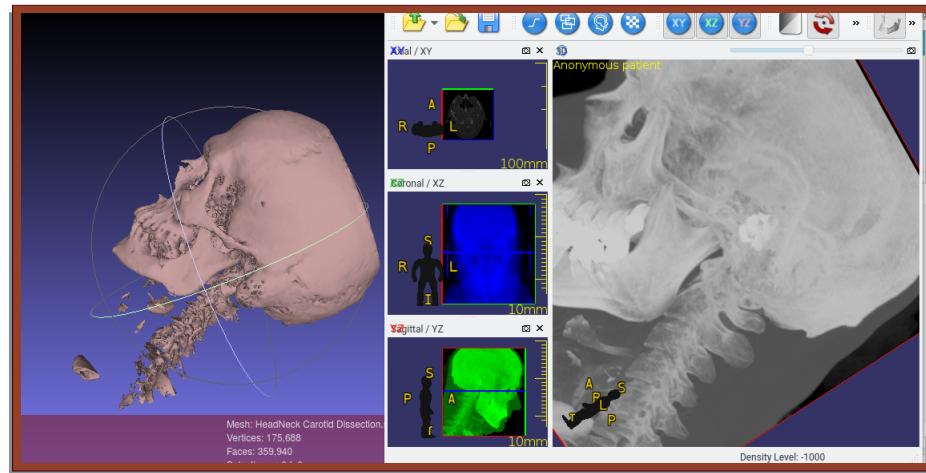
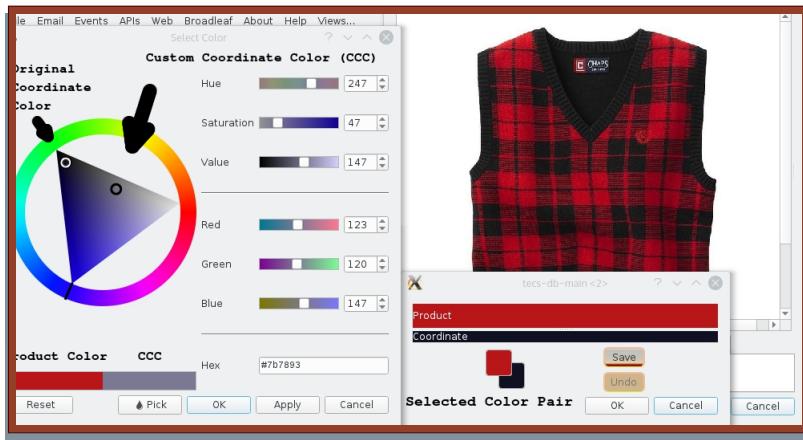
- ▶ Global
- ▶ 7719-09-7
- ▶ 14641-93-1

Following up on the previous slide, here IQmol is launched a second time, with a request to view the molecular structure of lactose. In response, IQmol opens the Molecular Data file for lactose ($C_{12}H_{20}O_{11}$), but also reloads the prior session — in particular, the previously-viewed thionyl chloride file (7719-09-7) is also loaded (and can be viewed from the side panel).



Thank You!

Please contact Linguistic Technology Systems for more information about dsC and/or other Software Development and Software Language Engineering Solutions: (917) 817-2184.



Linguistic Technology Systems

