Chapter 5
Productivity Applications

Objectives

- ✓ Brief intro to
  - word processing,
  - desktop publishing, and
  - Web publishing.
- ✓ Impact of desktop publishing and Web publishing on the concept of freedom of the press (1st Amendment:
- ✓ http://www.usconstitution.net/const.html).




Objectives (continued)

- ✓Intro to basic functions and applications of spreadsheets
- ✓ Indicate other types of statistical, financial, and simulation software.
- ✓Explain how computers can be used to answer "What if?" questions.
- ✓Explain how computers are used as tools for simulating mechanical, biological, and societal systems.




The Wordsmith's Toolbox

- Working with a word processor involves several steps:
  - Entering text
  - Editing text
  - Formatting the document
  - Proofreading the document
  - Saving the document on disk
  - Printing the document

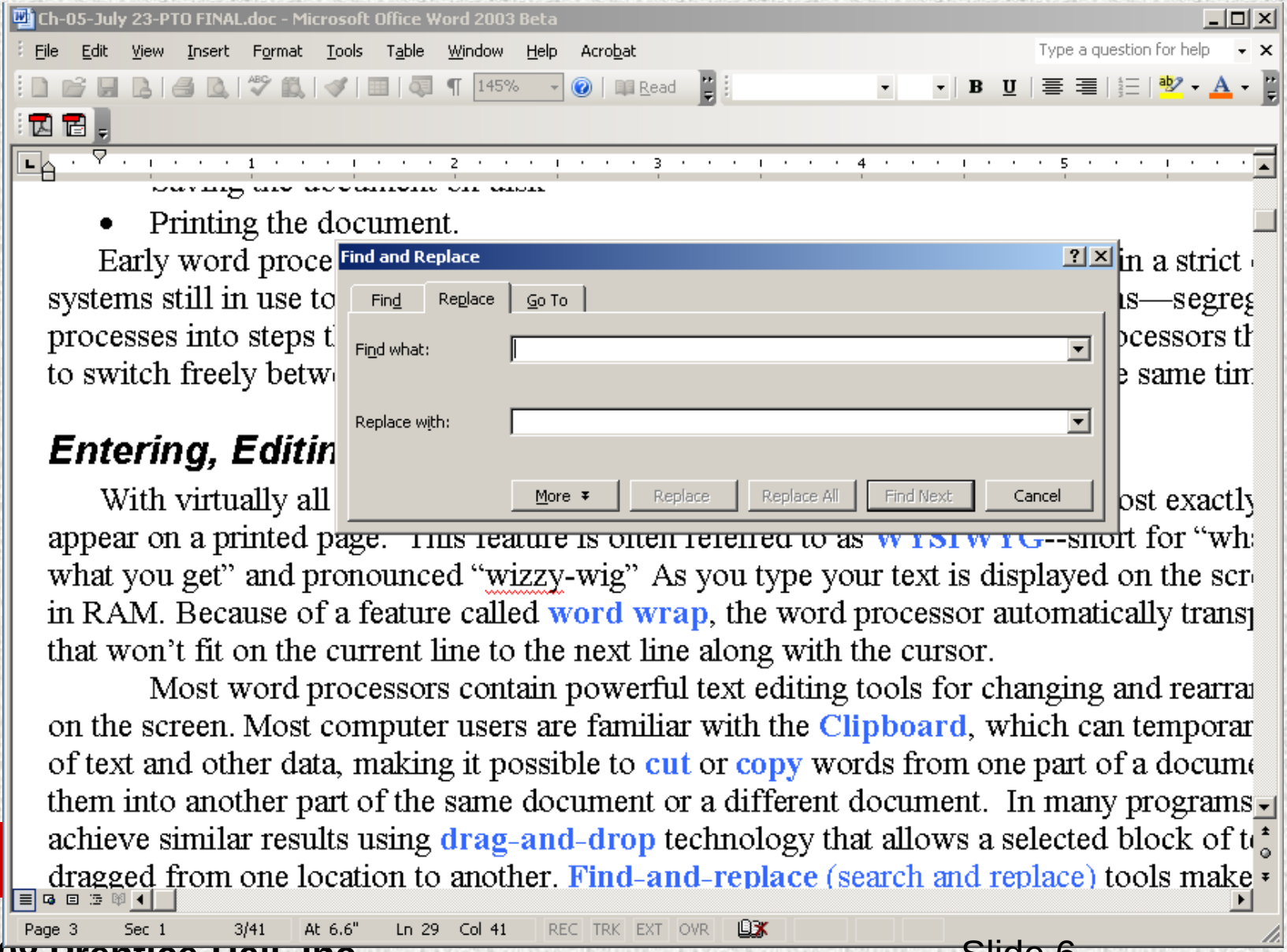



The Wordsmith's Toolbox

- ✓Entering, Editing, and Formatting Text
  - ➢Entering text
    - ❑Text is displayed on the screen and stored in the computer's RAM.
    - ❑Save your work periodically (on the disk) because RAM is not permanent memory.
  - ➢Editing text
    - ❑Navigate to different parts of a document.
    - ❑Insert or delete text at any point.
    - ❑Move and copy text.
    - ❑Search and replace words or phrases.




The Wordsmith's Toolbox



Word Processors and Other Word Tools

- Formatting commands
  - Formatting characters
    - Characters are measured by point size (one point = 1/72 inch).
    - A font is a size and style of typeface.
    - Serif fonts have serifs or fine lines at the ends of each character.
    - You can use monospaced fonts and proportionally-spaced fonts.




Word Processors and Other Word Tools

- Typical font size in a human-readable document is 10 to 12 points.
- Zoom may display font larger or smaller than the actual size.

Arial

The Wordsmith's Toolbox

- Formatting the document
  - Stylesheets
  - Headers and footers
  - Multiple variable-width columns
  - Graphics
  - Math formulas and other special symbolics

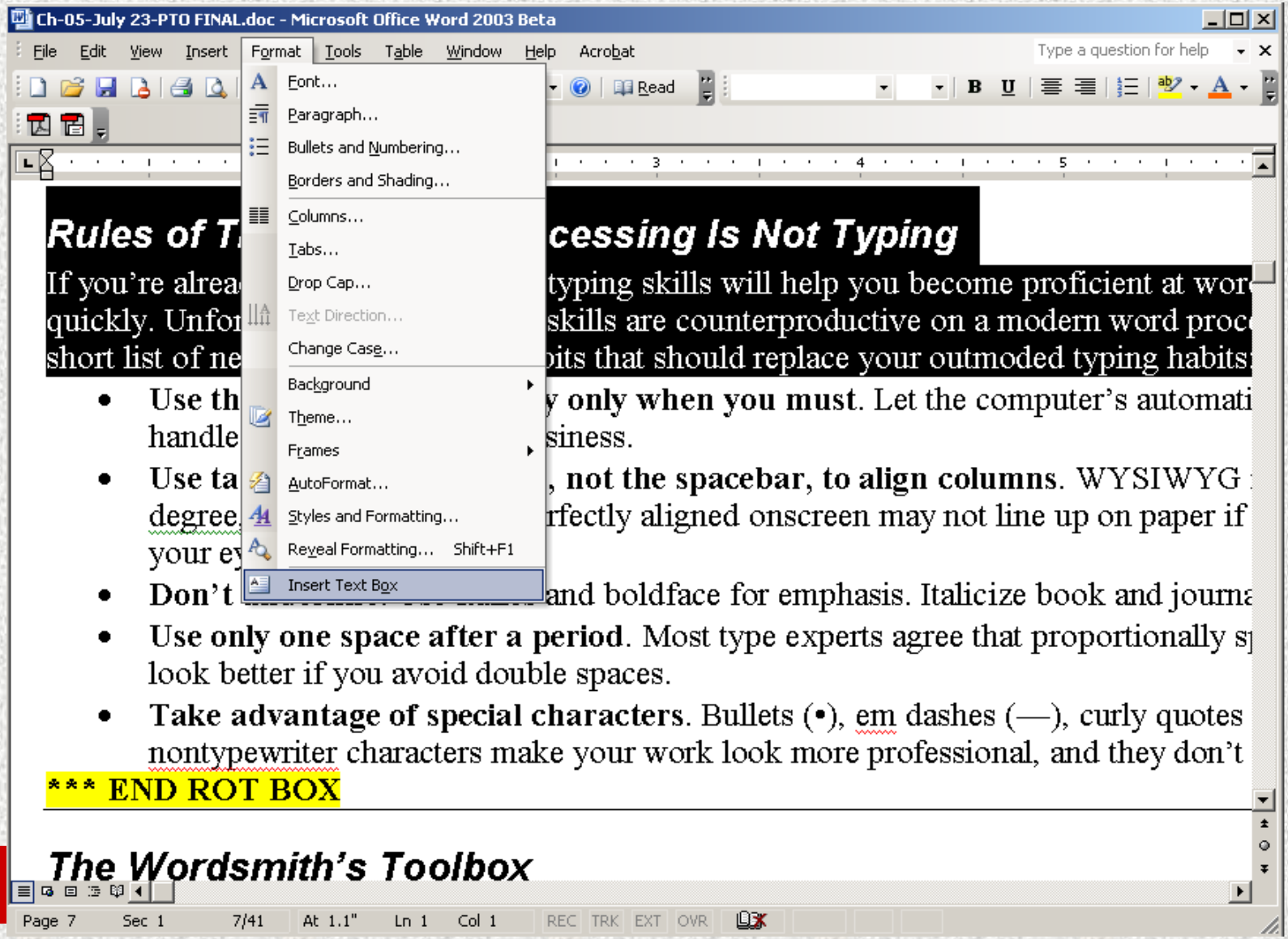



The Wordsmith's Toolbox

- Formatting the document (cont'd)
  - Automatic editing features
  - Hidden comments
  - Table of contents, (cross-)references, and indexes
  - Help features
  - Conversion to HTML for Web publishing
  - WYSIWYG vs. the actual code




The Wordsmith's Toolbox

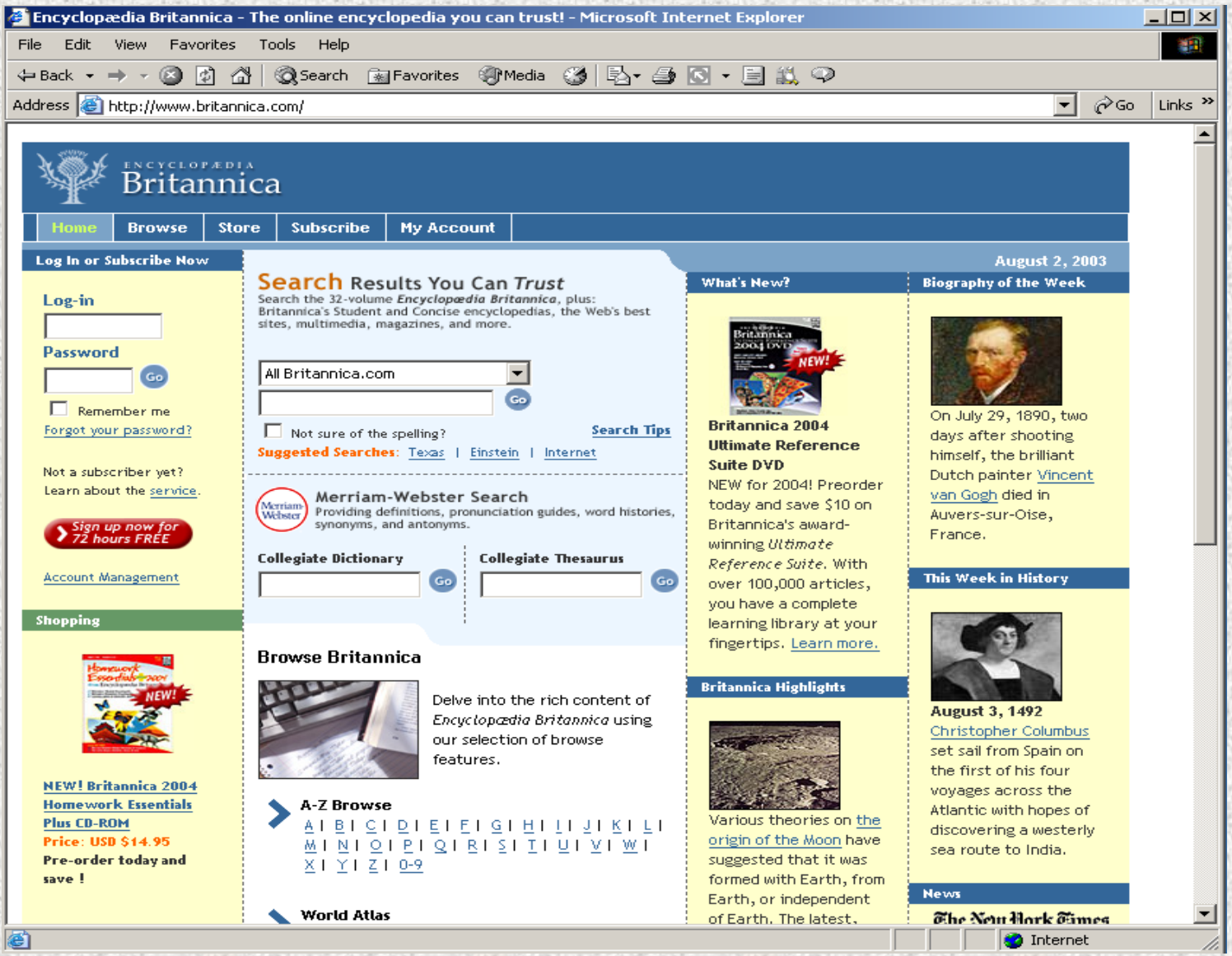


The Wordsmith's Toolbox

- ✓ Digital References
  - ➢ What's available:
    - Dictionaries,
    - quotation books,
    - encyclopedias,
    - atlases,
    - almanacs, and
    - other references.




The Wordsmith's Toolbox



The Wordsmith's Toolbox

- ✓Digital References
  - ➢The biggest advantage of the electronic form is speed of access and searchability.
  - ➢The biggest drawback is that quick and easy copying encourages plagiarism and violations of copyright.

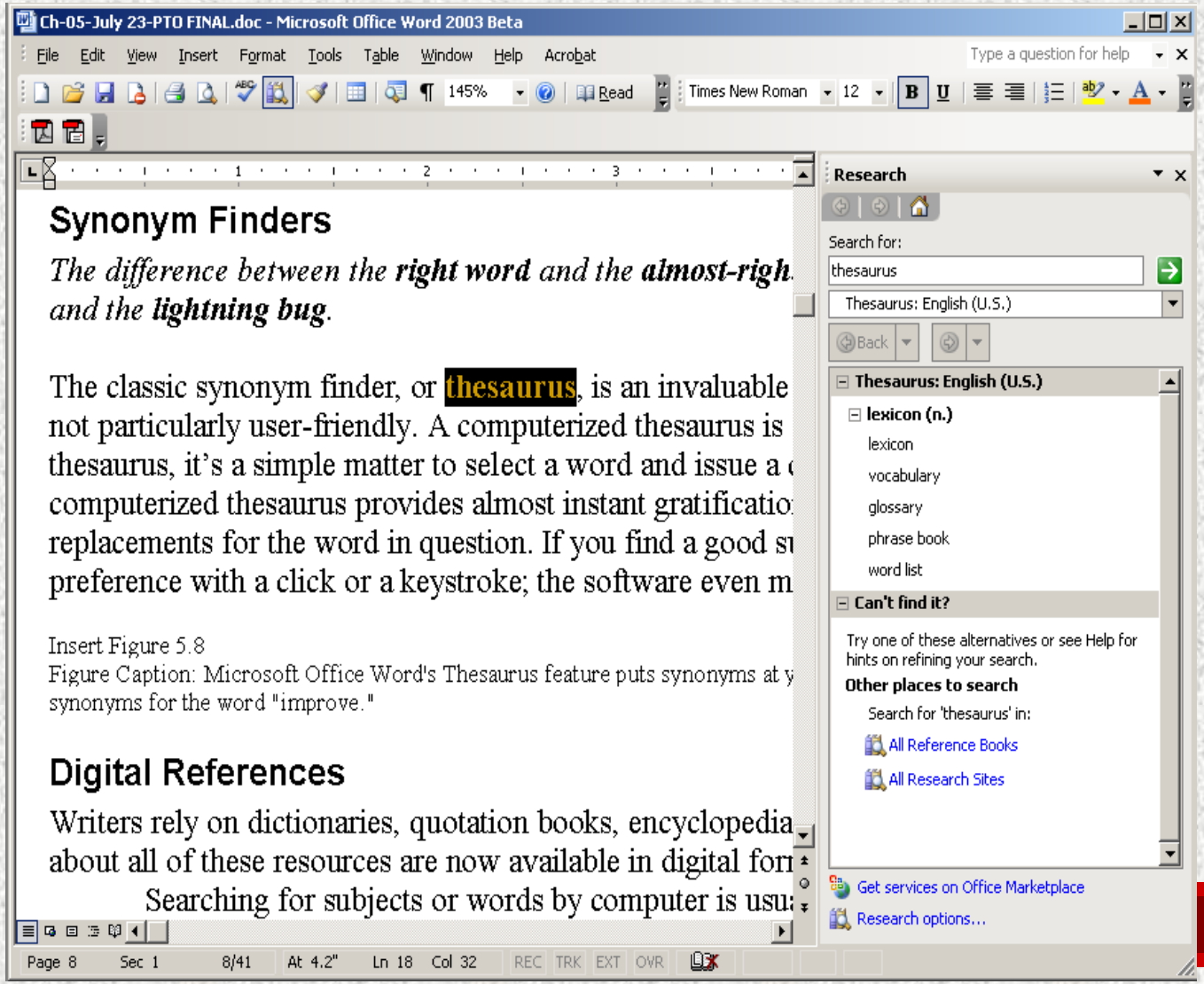



The Wordsmith's Toolbox

- ✓ Synonym Finders
  - ➢ A computerized thesaurus can provide instantaneous feedback for synonyms




The Wordsmith's Toolbox

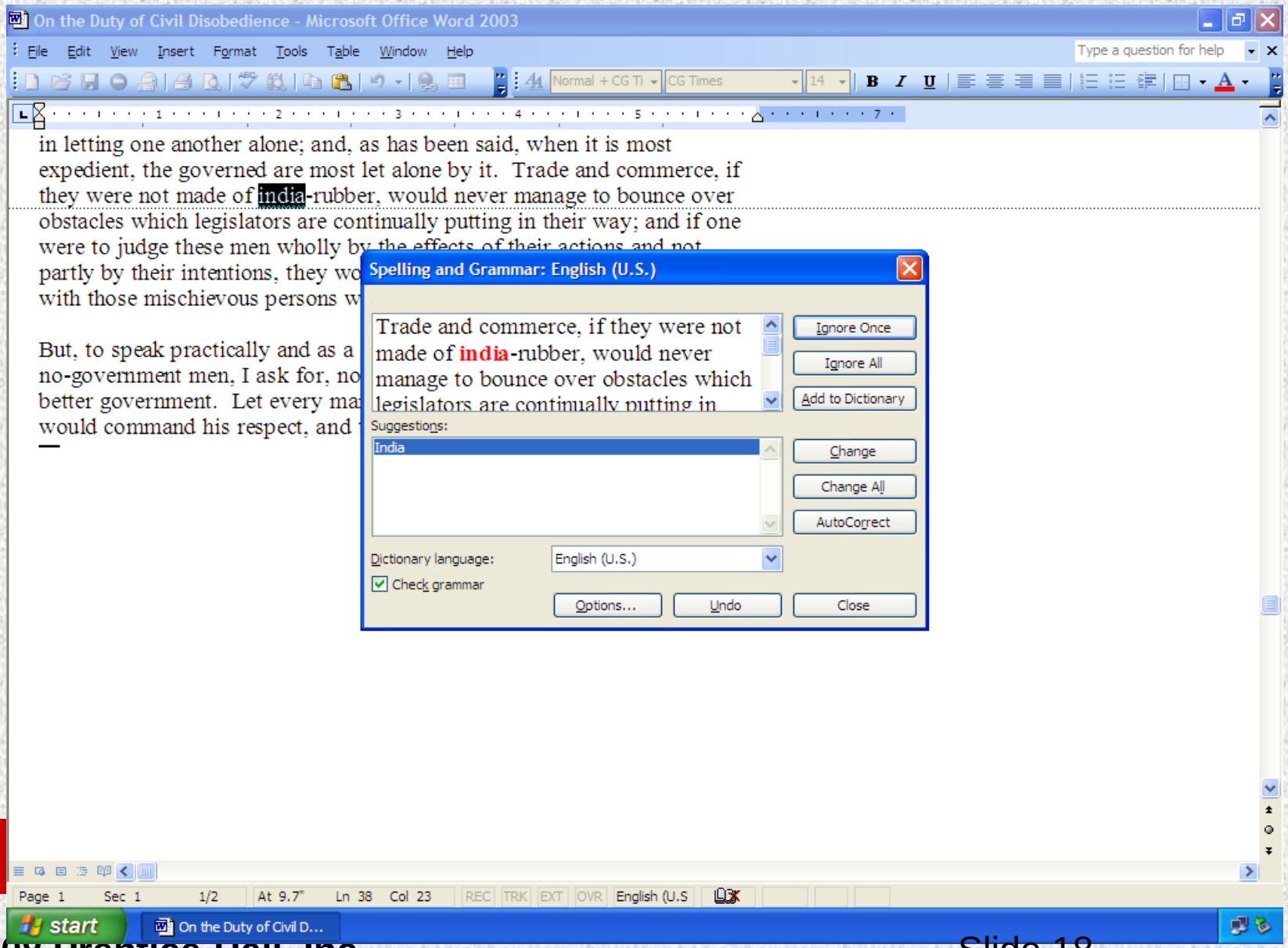


The Wordsmith's Toolbox

- ✓Spelling Checkers
  - ➢Compare words in your document with words in a disk- or Web-based dictionary
    - ❑Words might be flagged, but you make the decision to ignore or change the spelling.

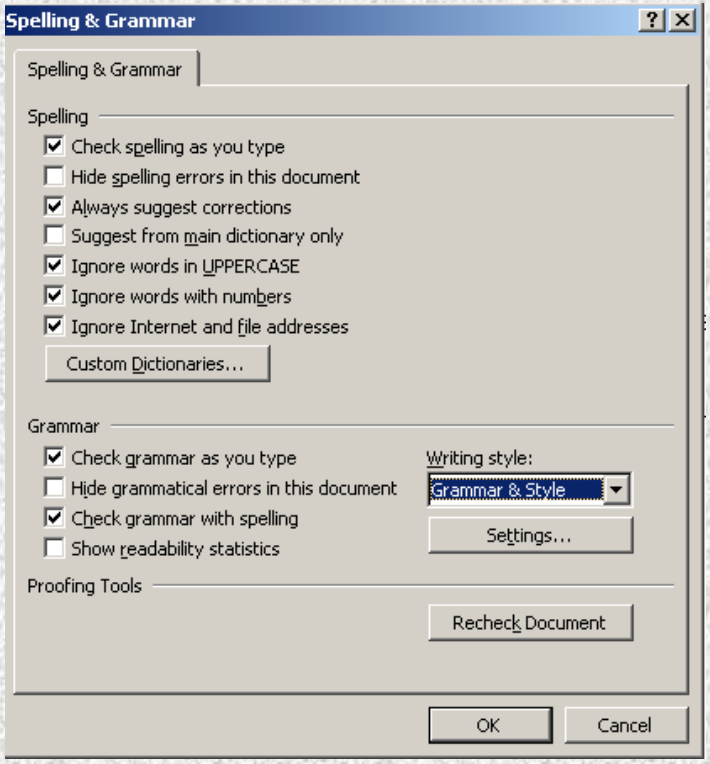



The Wordsmith's Toolbox



Tomorrow's Technology and You 8/e
Chapter 5
The Wordsmith's Toolbox

- ✓Grammar and Style Checkers
  - Analyze each word in context, checking for errors of content
  - Check spelling
  - Point out possible errors and suggest improvements
  - Analyze prose complexity using measurements such as sentence length and paragraph length



The Wordsmith's Toolbox

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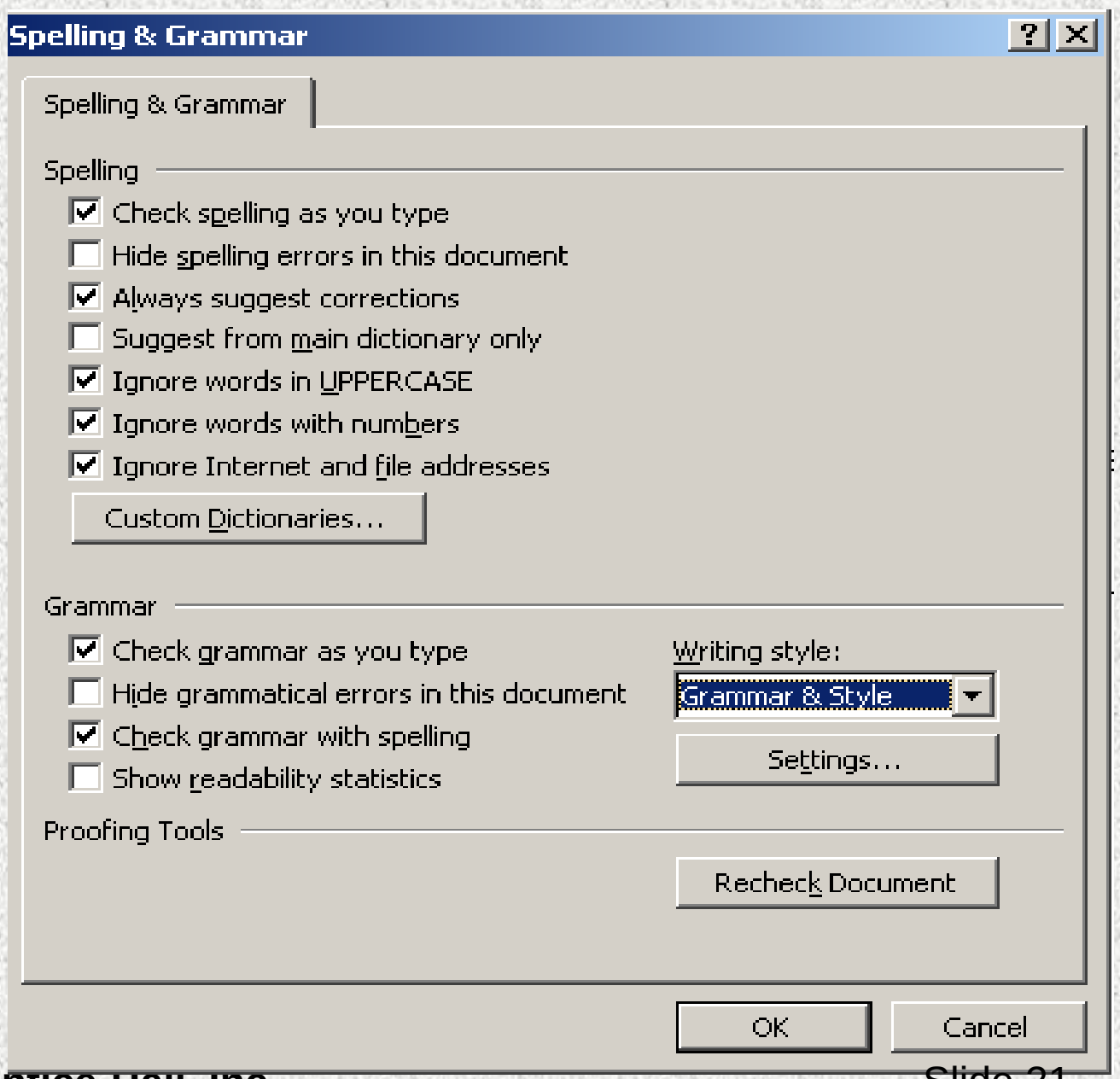
The Wordsmith's Toolbox



The Wordsmith's Toolbox

- ✓Form Letter Generators
  - ➢**Mail merge** capabilities produce personalized form letters.
    - ❑Create a database with names.
    - ❑Create a form letter.
    - ❑Merge the database with the form letter to create a personalized letter.

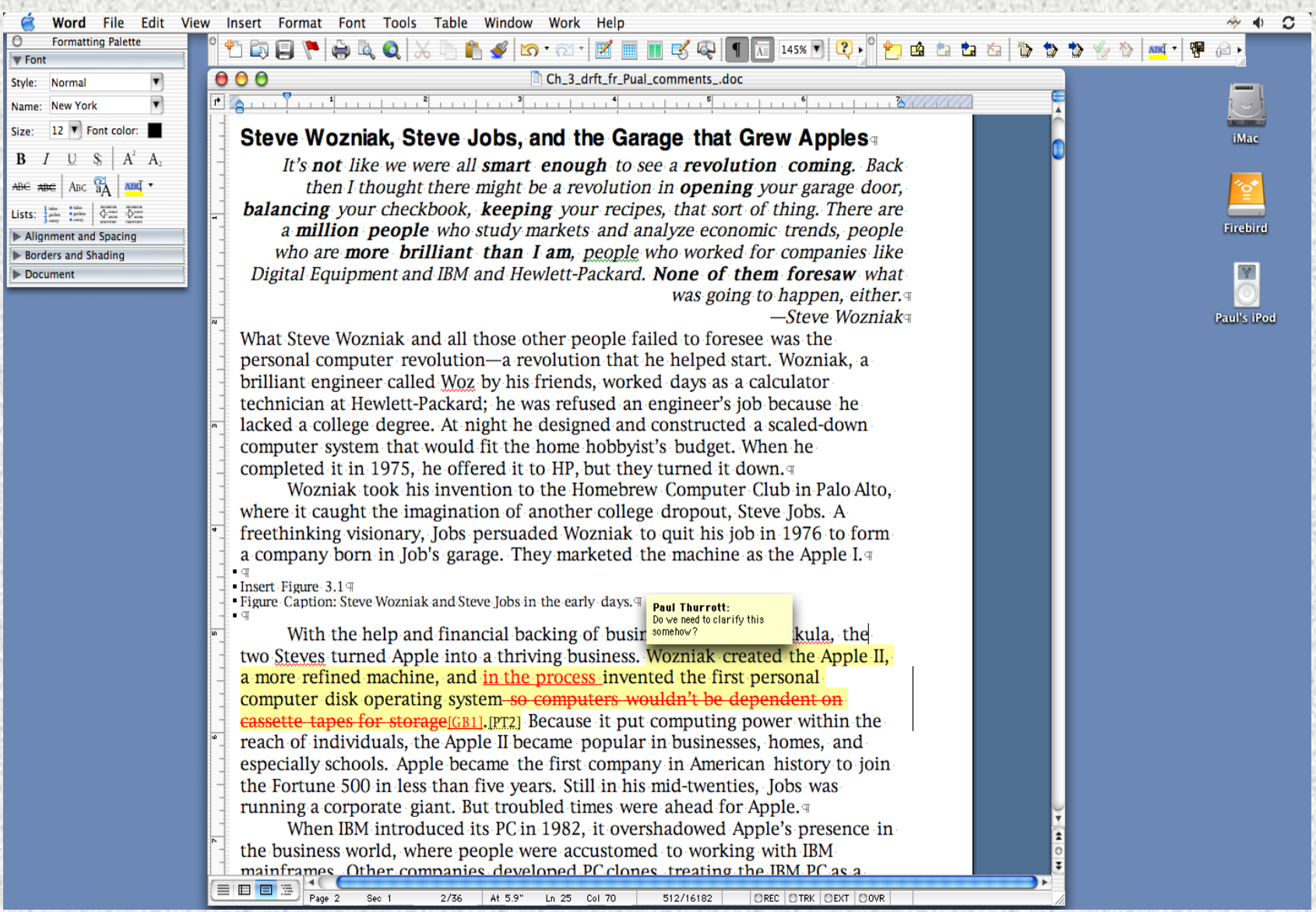



The Wordsmith's Toolbox

- **Collaborative Writing Tools**
  - **Groupware:** software designed to be used by a workgroup
    - Provides for collaborative writing and editing
    - Tracks changes and identifies them by the originator's name
    - Compares document versions and highlights differences in documents




The Wordsmith's Toolbox



Emerging Word Tools

- ✓Processing handwritten words
- ✓Processing words with software that can reliably recognize human speech
- ✓Problems: Complexity and reliability

The Desktop Publishing Story

What Is Desktop Publishing?

- The process of producing a book, magazine, or other publication includes several steps:
  - Writing text
  - Editing text

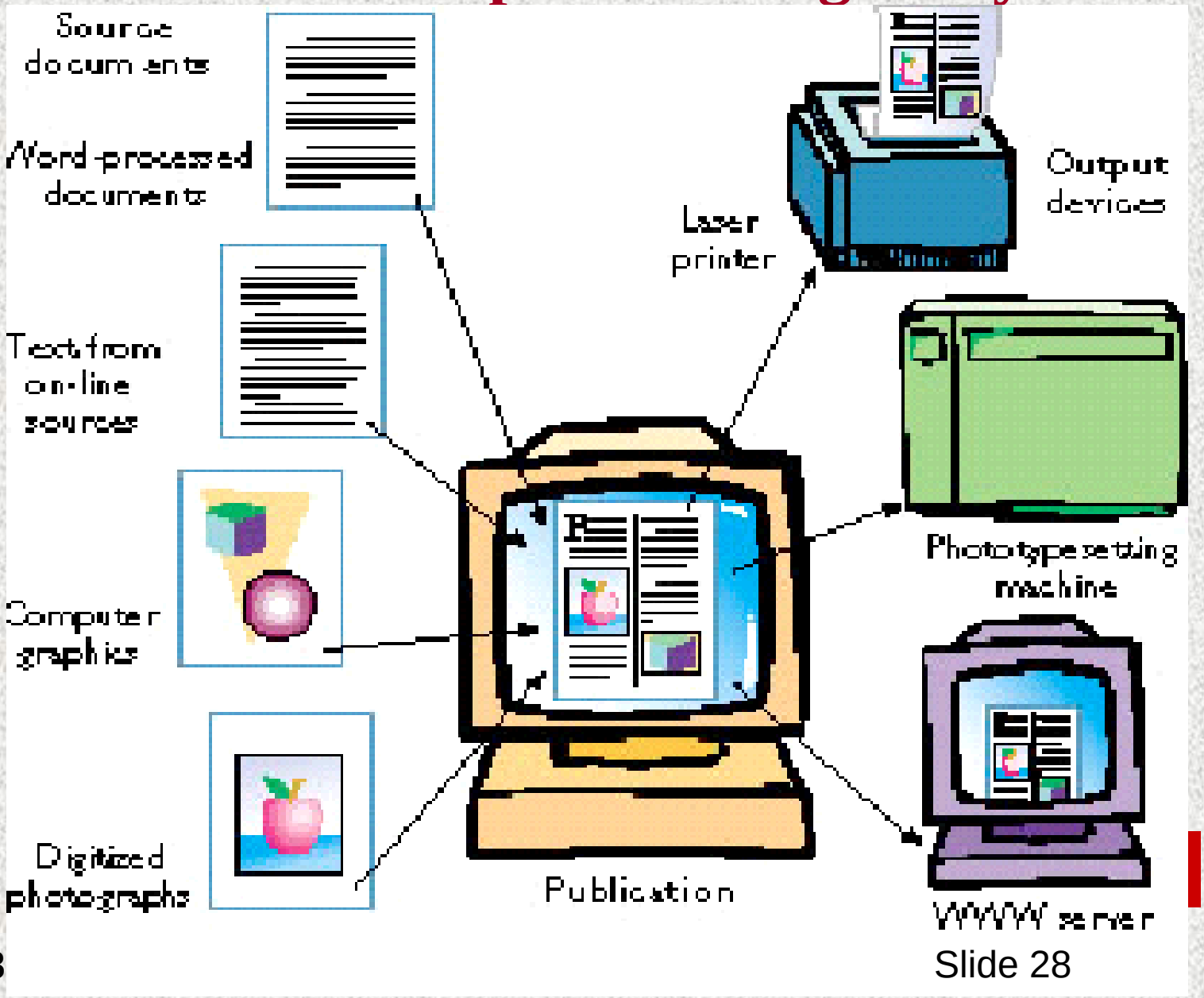



The Desktop Publishing Story

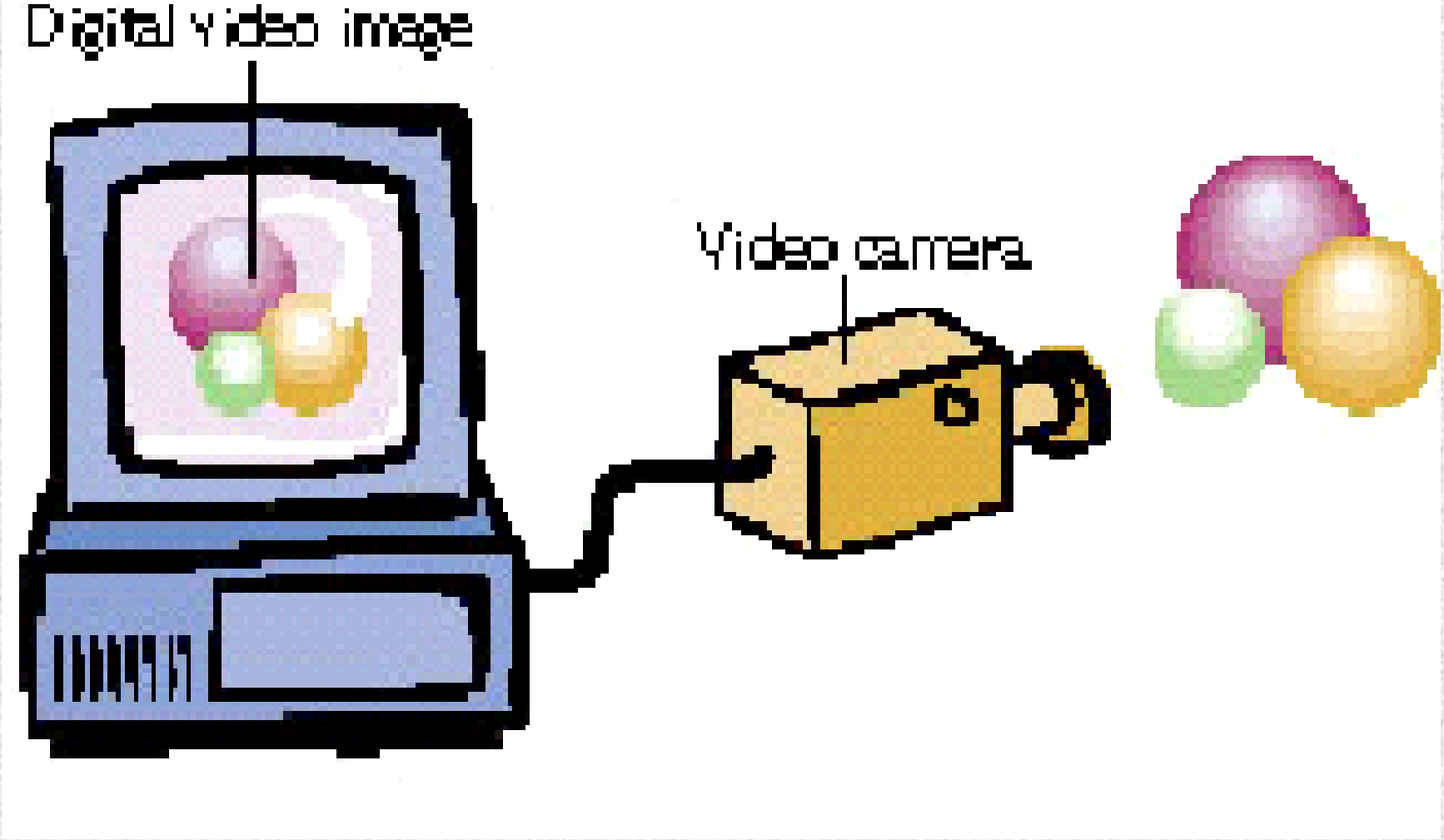
- Producing drawings, photographs, and other graphics to accompany the text
- Designing a basic format for the publication
- Typesetting text
- Arranging text and graphics on pages
- Typesetting and printing pages
- Binding pages into a finished publication




The Desktop Publishing Story



The Desktop Publishing Story



The Desktop Publishing Story

- A desktop publishing (DTP) system generally includes:
  - One or more desktops
  - A scanner
    - Transforms photographs and hand-drawn images into computer-readable documents
  - A high-resolution printer
  - Software




The Desktop Publishing Story

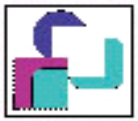
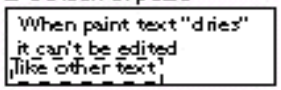
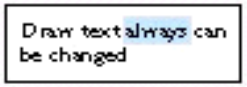
- Desktop publishing software:
  - Image-editing software
  - Page-layout software combines the various source documents into a coherent, visually appealing publication
    - QuarkXpress
    - PageMaker
    - Adobe InDesign




The Desktop Publishing Story

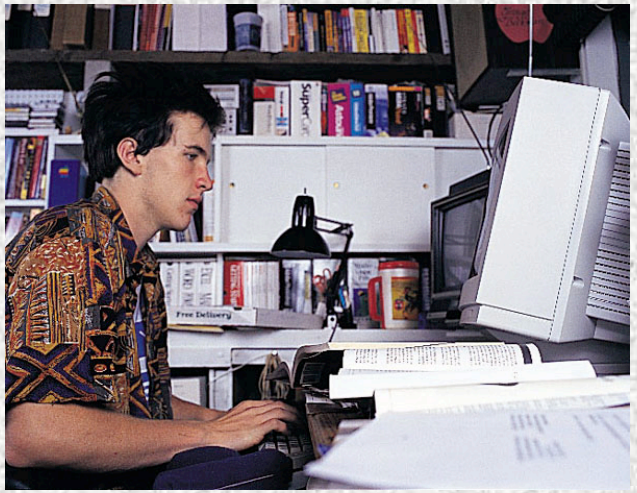
Pixels versus Objects

How do you edit a picture? It depends on what you're doing and how the picture is stored.

The task . . .	Using bit-mapped graphics	Using object-oriented graphics
Moving and removing parts of pictures 	Easier to work with regions rather than objects (note), especially if those objects overlap 	Easier to work with individual objects or groups of objects, even if they overlap 
Working with shapes 	Shapes stored as pixel patterns can be edited with eraser and drawing tools 	Shapes stored as math formulas can be transformed mathematically 
Magnification 	Magnifies pixels for fine detail editing 	Magnifies objects, not pixels 
Text handling 	Text "dries" and can't be edited, but can be moved as a block of pixels 	Text can always be edited 
Printing	Resolution of printout can't exceed the pixel resolution of the stored picture	Resolution is limited only by the output device
Working within the limits of the hardware	Photographic quality is possible but requires considerable memory and disk storage	Complex drawings require considerable computational power for reasonable speed

The Desktop Publishing Story

- ✓Why Desktop Publishing?
  - ➢Saves money
  - ➢Saves time
  - ➢Breaks the monopoly of the big media

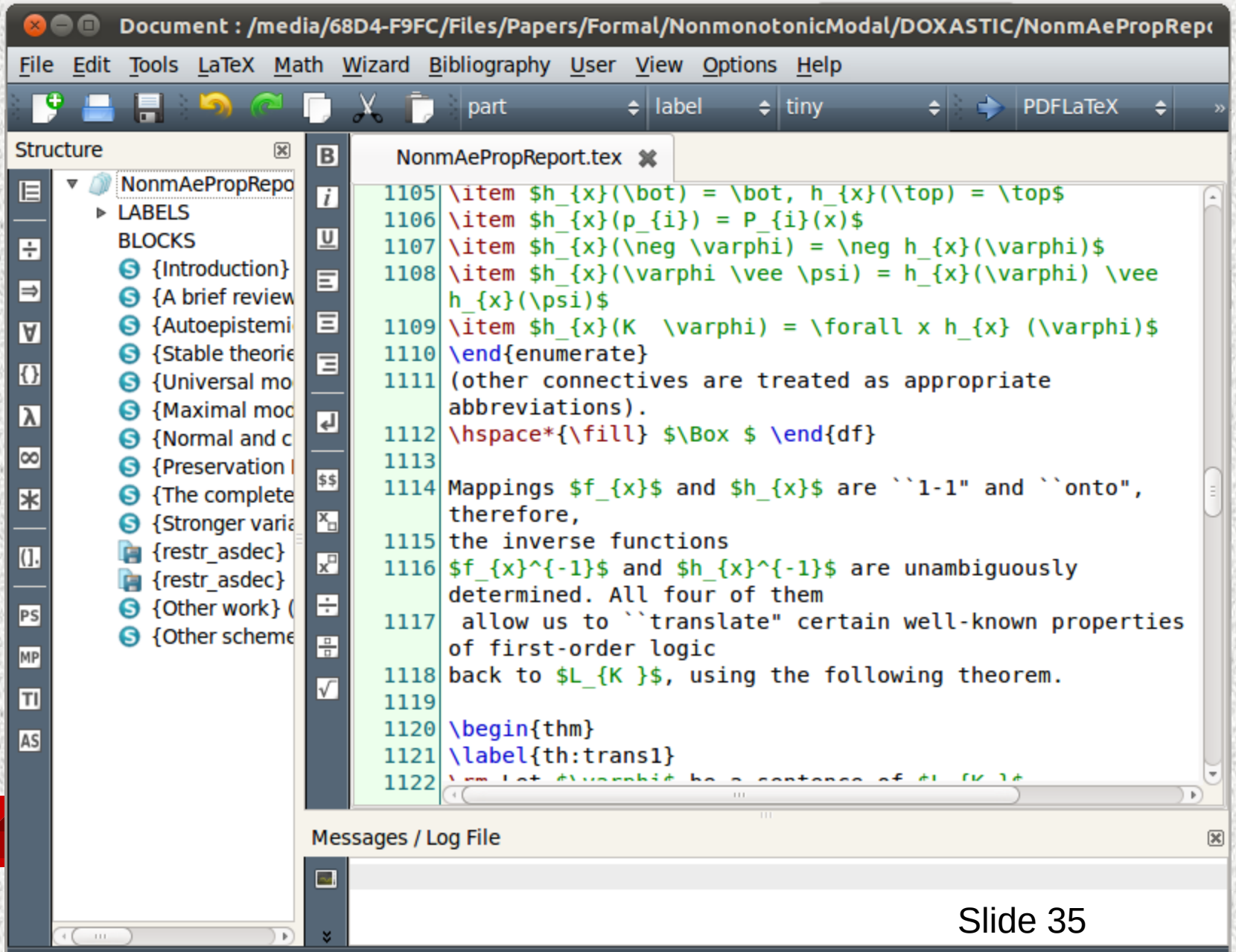


Beyond the Printed Page

- ✓Paperless Publishing and the Web
  - ➢Breaks the monopoly on information of the big media
- ✓Electronic Books and Digital Paper
  - ➢**The electronic book**, or **ebook**
  - ➢Digital paper, or epaper, is a flexible, portable, paper-like material that can dynamically display black-and-white text and images on its surface.




LaTeX: scientific publishing software



Earths_radiator.pdf - Adobe Reader

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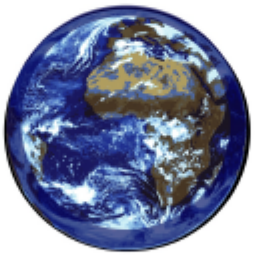
Earth's Radiator

February 23, 2011

The mathematics of AGW needs some explanation on part of the AGW advocates, to say the least. The way they average over sets of values of non-linear functions leaves a reasonable doubt about mathematical correctness of their conclusions, particularly under the circumstances when their main prediction refers to the average temperature of Earth's atmosphere.



A typical textbook that covers the physics of climate invokes, implicitly or explicitly, the Stefan-Boltzmann law as a theoretic basis for the model of Earth's radiation of heat into the space. The law states that:

$$E = e \times s \times T^4 \quad (1)$$

where

- e is is the relative emissivity of the radiating body (for instance, the Earth, the top of the atmosphere, etc.),
- $s = 5.67 \times 10^{-8} W m^{-2} K^{-4}$ is the Stefan-Boltzmann constant,
- T is the temperature of the radiating body in kelvins [K] (temperature in kelvins = temperature in Celsius degrees + 273.15 = (temperature in Fahrenheit degrees - 32) / 1.8 + 273.15).

E is the irradiance [in $W m^{-2}$] – the density of the heat radiated by the radiating body,

Slide 36

$$C_{sort}(n) = 3 \times \Sigma_{i=1}^{n-1} \lfloor \log_2 i \rfloor + \lfloor \log_2 n \rfloor.$$

Let's compute first the sum $S_M = \Sigma_{i=1}^{M} \lfloor \log_2 i \rfloor = \Sigma_{i=1}^{M} level(i)$. This sum is adding the levels of all nodes of the heap with M nodes together, so it can be split on the sum of all levels of the nodes that are in the first D_M levels (ranging from 0 to $\lfloor \log_2 M \rfloor - 1$) plus the sum of the levels of the nodes that are in the last level $D_M = \lfloor \log_2 M \rfloor$), as the example for $M = 18$ on Figure 1 shows.

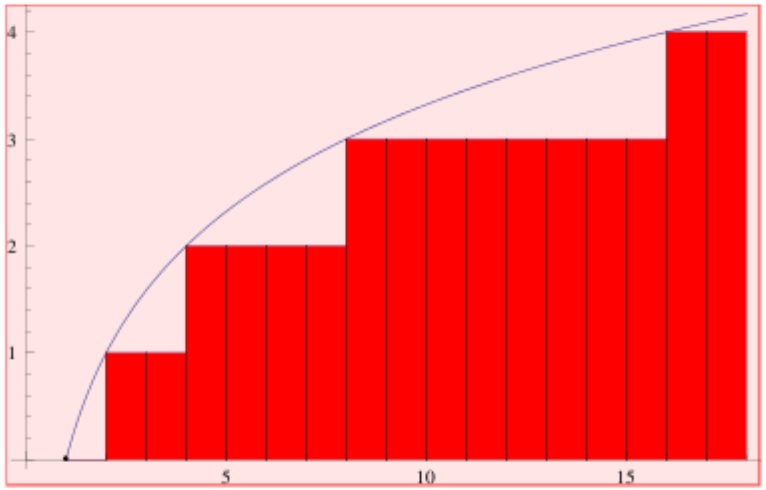


Figure 1: Computation of $\Sigma_{i=1}^{18} \lfloor \log_2(i) \rfloor$

There are

$$\Sigma_{j=0}^{\lfloor \log_2 M \rfloor - 1} 2^j = 2^{\lfloor \log_2 M \rfloor} - 1$$

nodes in the first $\lfloor \log_2 M \rfloor - 1$ levels of the heap, so the last level must contain $M - (2^{\lfloor \log_2 M \rfloor} - 1) = M - 2^{\lfloor \log_2 M \rfloor} + 1$ nodes. Therefore, we obtain:

Lemma 8.5 For every stable theories E, E' in L_K, and every Herbrand structures $\mathfrak{M}$, $\mathfrak{M}'$ for L^H with $\mathfrak{M} \overset{PC}{\models} H(E_{K_1})$ and $\mathfrak{M}' \overset{PC}{\models} H(E'_{K_1})$,

$$\mathfrak{M} \leq \mathfrak{M}' \text{ iff } E \sqsubseteq E'.$$

Proof. ($\Rightarrow$). Assume $\mathfrak{M} \leq \mathfrak{M}'$ and $E \not\sqsubseteq E'$. Let $\varphi \in E_{Obj} \setminus E'_{Obj}$. We have: $\varphi \in E_{Obj}$ then $K\varphi \in E_{K_1}$ then $R(\varphi) \in H(E_{K_1})$ then $\mathfrak{M} \overset{PC}{\models} R(\varphi)$ then $\mathfrak{M}' \overset{PC}{\models} R(\varphi)$. Also, $\varphi \notin E'_{Obj}$ then $\neg K\varphi \in E_{K_1}$ then $\neg R(\varphi) \in H(E'_{K_1})$ then $\mathfrak{M}' \overset{PC}{\models} \neg R(\varphi)$; a contradiction.

($\Leftarrow$). Assume $\mathfrak{M} \not\leq \mathfrak{M}'$. Let φ be in L and satisfy $\mathfrak{M} \overset{PC}{\models} R(\varphi)$ and $\mathfrak{M}' \overset{PC}{\not\models} R(\varphi)$. Hence $\mathfrak{M} \overset{PC}{\not\models} \neg R(\varphi)$ and $\mathfrak{M}' \overset{PC}{\not\models} R(\varphi)$, therefore $\mathfrak{M} \overset{PC}{\not\models} H(\neg K\varphi)$ and $\mathfrak{M}' \overset{PC}{\not\models} H(K\varphi)$, therefore $H(\neg K\varphi) \notin H(E_{K1})$ and $H(K\varphi) \notin H(E'_{K1})$, therefore $\neg K\varphi \notin E_{K1}$ and $K\varphi \notin E'_{K1}$, therefore (by stability of E and E', and by modal-freedom of φ) $K\varphi \in E_{K1}$ and $\neg K\varphi \in E'_{K1}$, therefore $\varphi \in E$ and $\varphi \notin E'$. Thus $E \not\sqsubseteq E'$. □

To accomplish the goal of this section we need the following technical lemmas.

Lemma 8.6 For every set T of sentences of L_K,

$$H(T_{K_1 \cap mPos}) = H(T_{K_1})_{Pos \cap QF}.$$

Proof. $H(T_{K_1} \cap mPos) = H(T_{K_1}) \cap H(mPos) =$ (by Lemma 8.4.2) $H(T_{K_1}) \cap Pos \cap QF \supseteq Cn(H(T_{K_1}) \cap Pos \cap QF = H(T_{K_1})_{Pos \cap QF}$. There-

where all φ_i's and ψ_j's are modal-free, with

$$Cn_{S5}(T) = Cn_{S5}(\Pi).$$

Proof. By Theorem 7.5 every sentence φ of L_K is S5-equivalent to a K_1-sentence of L_K, and therefore is S5-equivalent to a K_1-sentence in conjunctive normal form with respect to atoms of the form $K\psi$, where ψ is modal-free. Let $\vartheta_1 \wedge ... \wedge \vartheta_n$ be such a K_1-sentence in conjunctive normal form. Let $\kappa(\varphi) = \{\vartheta_1, ..., \vartheta_n\}$, and let $\Pi = \bigcup\{\kappa(\varphi) \mid \varphi \in T\}$. Observation that $Cn_{S5}(T) = Cn_{S5}(\Pi)$ completes the proof. □

Other normal forms of autoepistemic sentences were investigated in [MaT91].

The latter result seems particularly interesting from the point of view of uniform representation of autoepistemic theories in a form of sets of clauses. This form of representation allows for transfer of methods and results of logic programming (cf. [Apt90]) into autoepistemic logic.

8 Preservation Properties

In this section we interpret in modal language L_K two classic theorems which turned out exceptionally useful in study of minimal model semantics of deductive data bases and logic programs. For this purpose we map K_1-sentences of L_K into a first-order language L^H. This mapping allows us to reflect expressible properties of structures for L^H into the language L_K and its semantics. Theorems 7.5 and 7.6 guarantee that translating just K_1-sentences is enough to cover entire L_K. Quite naturally, part of terminology of this section comes from theory of minimal models (cf. [McC80, Min82, BS84, Suc90]).

[Suc88] Marek A. Suchenek. On generalizations of the closed world assumption in deductive data bases. In *Fourth Southeastern Logic Symposium*, Columbia SC, March 24-25 1988.

[Suc90] Marek A. Suchenek. Applications of Lyndon homomorphism theorems to the theory of minimal models. *International Journal of Foundations of Computer Science*, 1(1):49–59, 1990.

[Suc93] Marek A. Suchenek. First-order syntactic characterizations of minimal entailment, domain minimal entailment, and Herbrand entailment. *Journal of Automated Reasoning*, 10:237–263, 1993.

[Suc94] Marek A. Suchenek. Preservation properties in deductive databases. *Methods of Logic in Computer Science An International Journal*, 1:315–338, 1994. An invited paper.

[Suc97] Marek A. Suchenek. Evaluation of queries under the closed-world assumption. *Journal of Automated Reasoning*, 18:357–398, 1997.

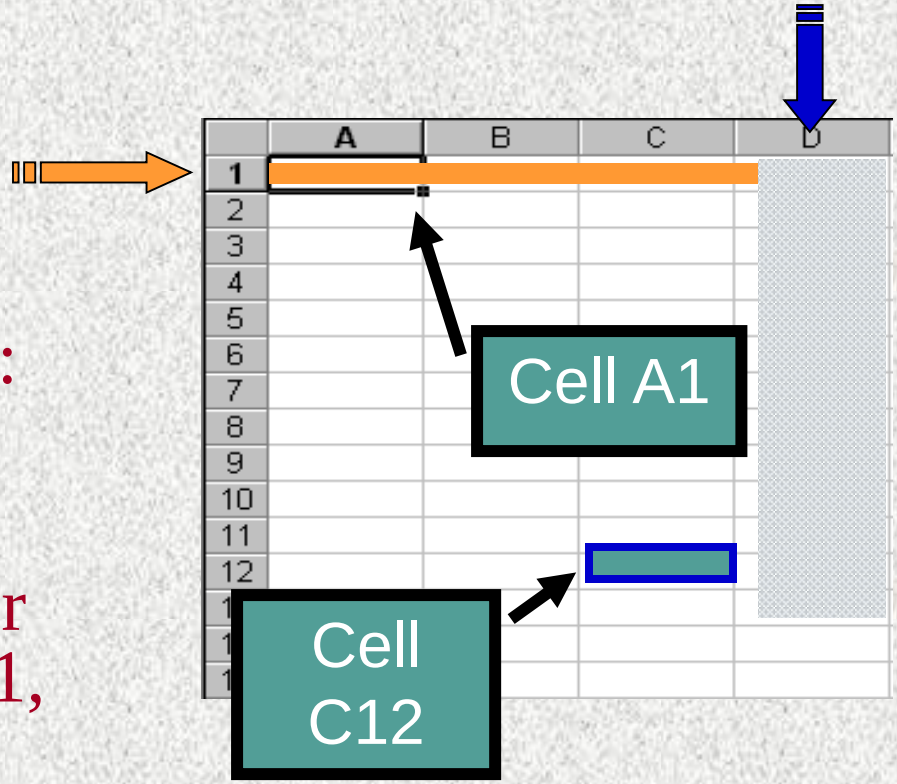
[Suc00a] Marek A. Suchenek. Evaluation of queries under the closed-world assumption II. *Journal of Automated Reasoning*, 25:247–289, 2000.

[Suc00b] Marek A. Suchenek. Review of the book: G. Antoniou, "Nonmonotonic Reasoning", The MIT Press. *Bulletin of Symbolic Logic*, 6(4):484–490, 2000.

[Suc06] Marek A. Suchenek. On undecidability of non-monotonic logic. *Studia Informatica*, 1/2(7):127–132, 2006.

The Spreadsheet

The Malleable Matrix



- ✓The spreadsheet consists of:
  - ➢Cells (the intersection of a row and column)
  - ➢**Addresses** (column letter and row number, e.g., A1, C12)

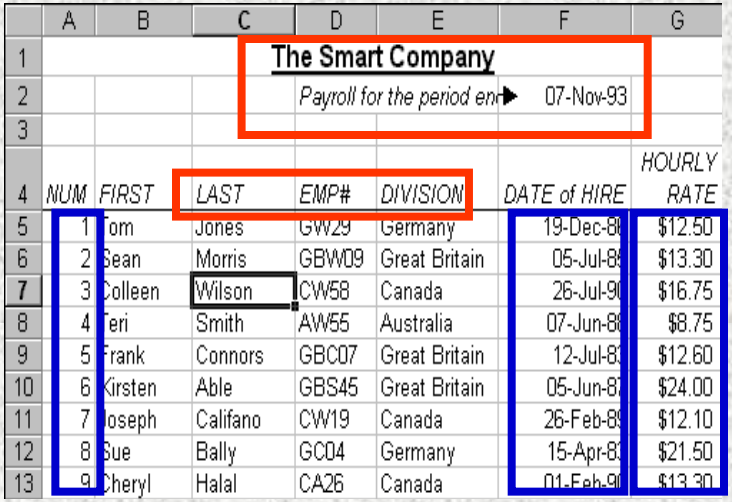
The Spreadsheet

Relative address (for example, B12) will be automatically modified when the cell is moved.

Absolute address (for example, $B12 or B$12 or B12) will retain its portion pereceded by a $ sign when the cell is moved.

The Spreadsheet

- Spreadsheets can contain:
  - **Values,** such as numbers and dates
  - **Labels,** such as column and report headings, that explain what the values mean



	A	B	C	D	E	F	G
1			The Smart Company				
2					Payroll for the period end	07-Nov-93	
3							
4	NUM	FIRST	LAST	EMP#	DIVISION	DATE of HIRE	HOURLY RATE
5	1	Tom	Jones	GW29	Germany	19-Dec-86	$12.50
6	2	Sean	Morris	GBW09	Great Britain	05-Jul-89	$13.30
7	3	Colleen	Wilson	CW58	Canada	26-Jul-90	$16.75
8	4	Teri	Smith	AW55	Australia	07-Jun-88	$8.75
9	5	Frank	Connors	GBC07	Great Britain	12-Jul-83	$12.60
10	6	Kirsten	Able	GBS45	Great Britain	05-Jun-87	$24.00
11	7	Joseph	Califano	CW19	Canada	26-Feb-89	$12.10
12	8	Sue	Bally	GC04	Germany	15-Apr-83	$21.50
13	9	Cheryl	Halal	CA26	Canada	01-Feb-91	$13.30

The Spreadsheet

- **Formulas** allow the user to create instructions using mathematical expressions and commands.

+ (plus)
- (minus)
***(multiplication)**
/ (division)
Sum
Average

5	PPE	135	120
6	IDI	65	88
7	CUC	29	16
8			
9	Totals	=B5+B6-B7	=SUM(C5:C7)




The Spreadsheet

- Formulas can be:
  - **Relative**, so they refer to different cells when they are copied
  - **Absolute**, so the formula references never change when they are copied

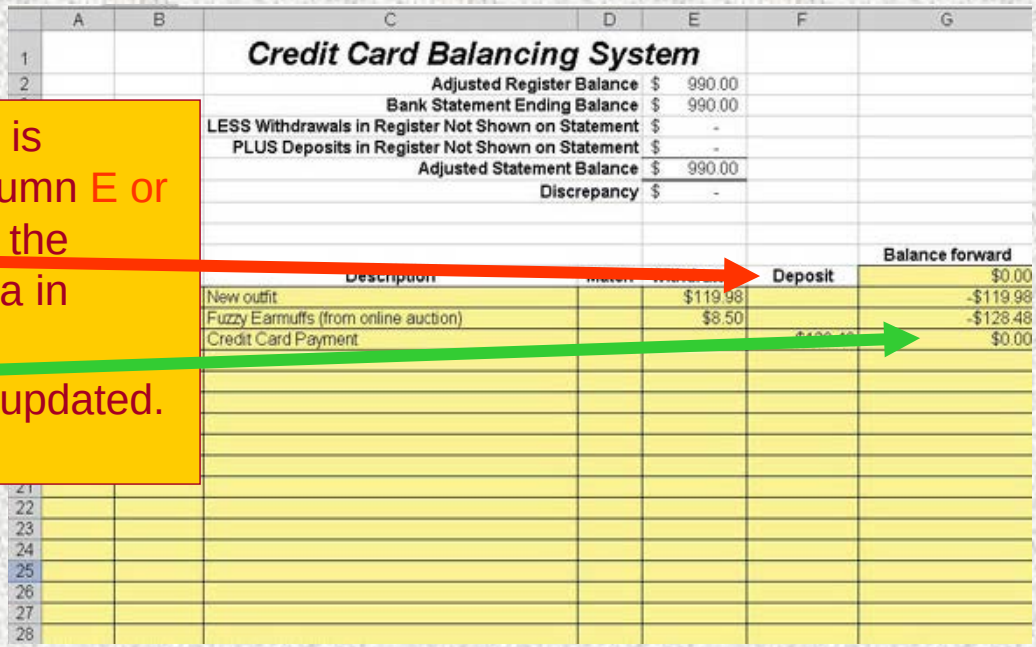
When the formula in column B is copied to column C, it changes *relative* to the new column.

	A	B	C
1			
2		The Smart Compa	
3		*Quarterly Sales Report*	
4			
5	**Location**	Qtr 1	Qtr 2
6	Australia	$1,500.00	$1,500.00
7	Germany	1,500.00	1,800.00
8	Canada	1,100.00	1,300.00
9	Great Britain	700.00	1,800.00
10	Quarter Total	=sum(B6:B9	=sum(C6:C9)

The Spreadsheet:

- Automatic recalculation (reference)
  - Any time a change is entered into the spreadsheet, all data related to the change automatically updates.

When a value is entered in column E or F the value of the related formula in column G is automatically updated.



	A	B	C	D	E	F	G
1			**Credit Card Balancing System**				
2			Adjusted Register Balance		$ 990.00		
3			Bank Statement Ending Balance		$ 990.00		
4			LESS Withdrawals in Register Not Shown on Statement		$ -		
5			PLUS Deposits in Register Not Shown on Statement		$ -		
6			Adjusted Statement Balance		$ 990.00		
7			Discrepancy		$ -		
8							
9							Balance forward
10			Description			Deposit	$0.00
11			New outfit		$119.98		-$119.98
12			Fuzzy Earmuffs (from online auction)		$8.50		-$128.48
13			Credit Card Payment				$0.00
14							
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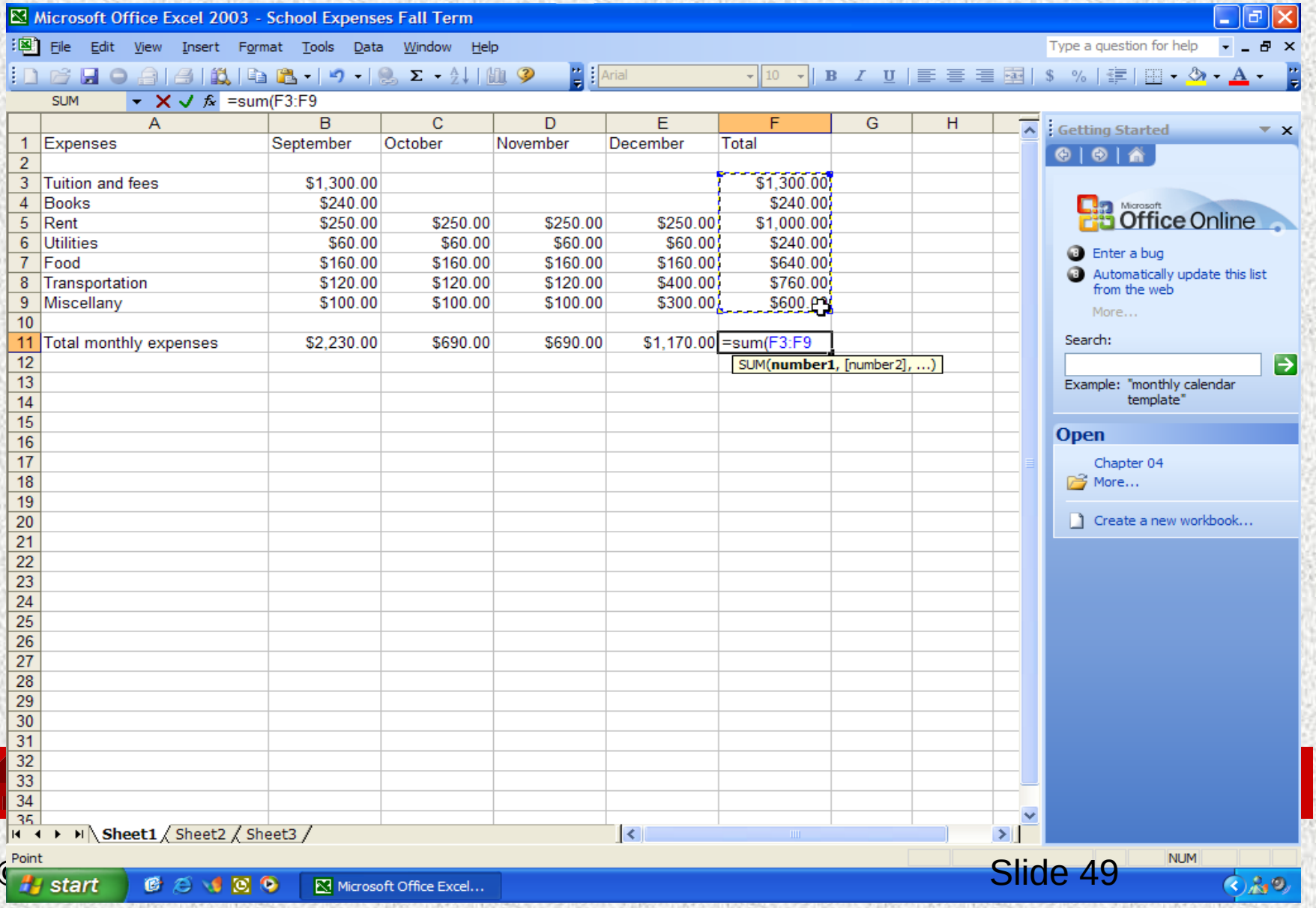
28							

The Spreadsheet

- **Functions** (e.g., SUM, AVG, SQRT) automate complex calculations.
- **Macros** store keystrokes and commands so they can be played back automatically.
- **Templates** offer ready-to-use worksheets with labels and formulas already entered.




The Spreadsheet



The Spreadsheet

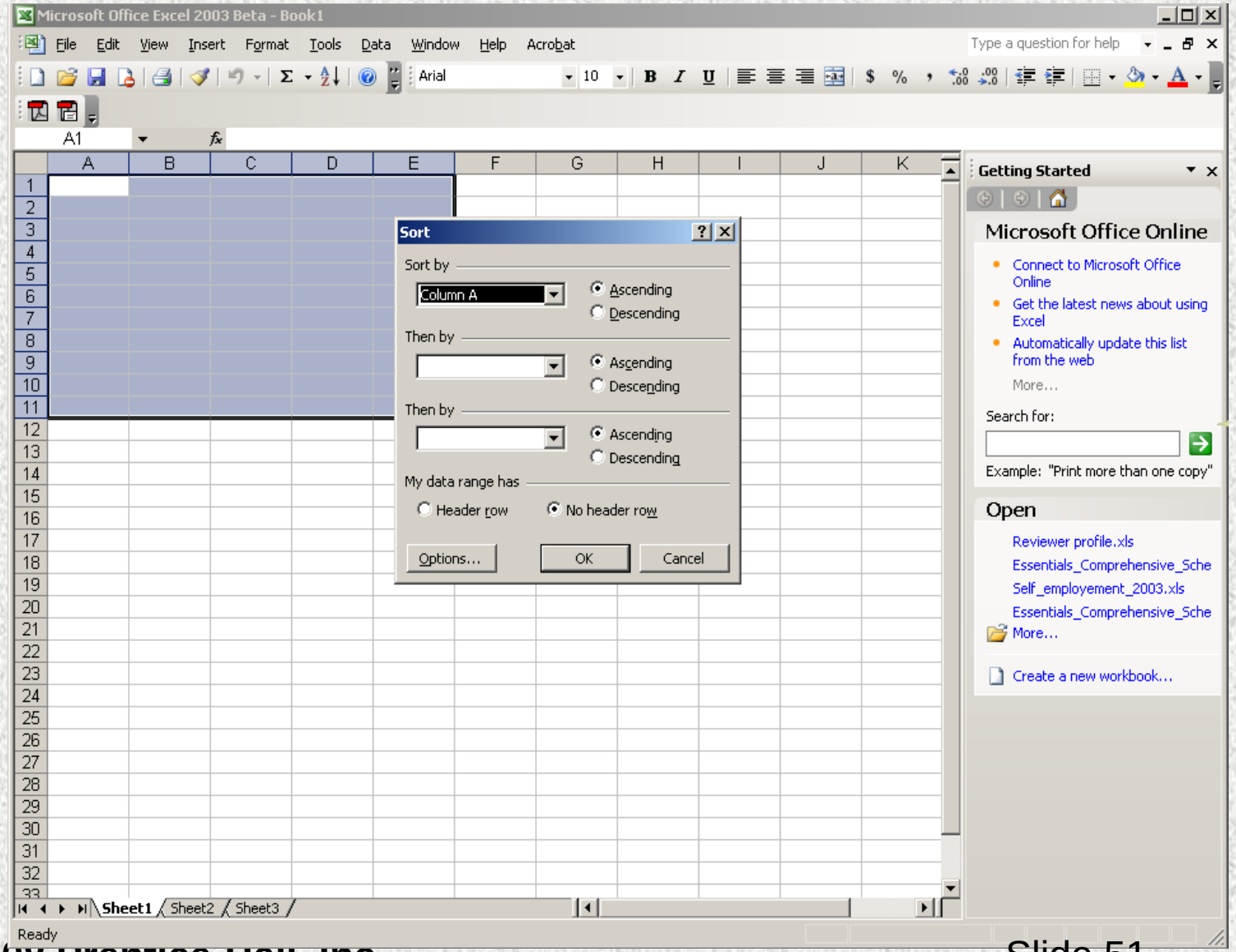
- Linking spreadsheets together
  - Referencing across sheets
- Relational database capabilities
  - Information storage and retrieval
  - Answers to queries (with SQL)
  - Sorting

http://upload.wikimedia.org/wikipedia/commons/6/6a/Sorting_quicksort_anim.gif

  - Generation of reports




The Spreadsheet



The Spreadsheet:

"What If?" Questions

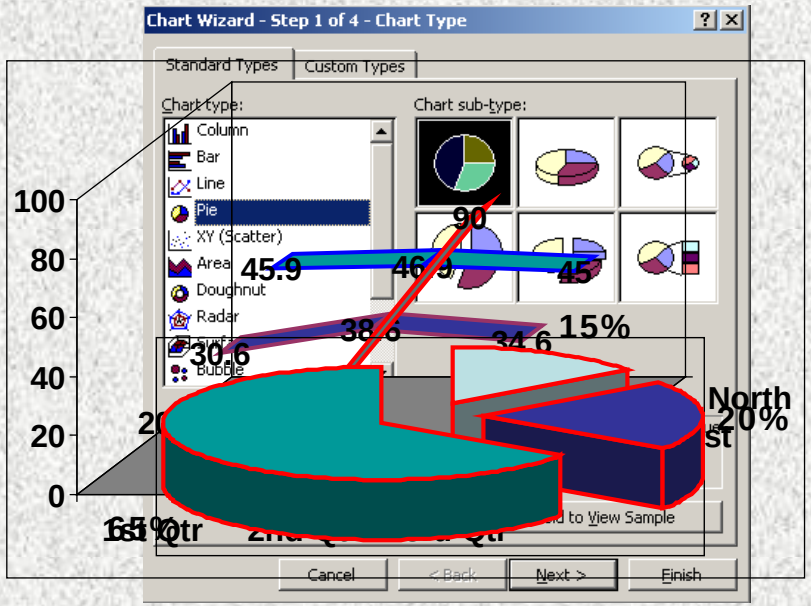
- ✓ Spreadsheets allow you to change numbers and instantly see the effects of those changes.
  - ➢ "*What if I enter this value*?"
- ✓ Equation solvers
  - ➢ Some spreadsheets generate data needed to fit a given equation and target value.




The Spreadsheet

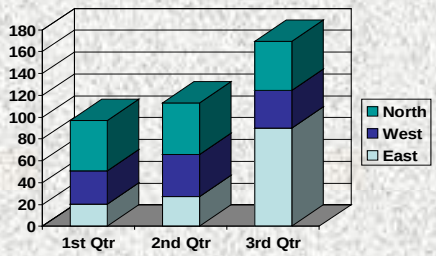
Spreadsheet Graphics: From Digits to Drawings

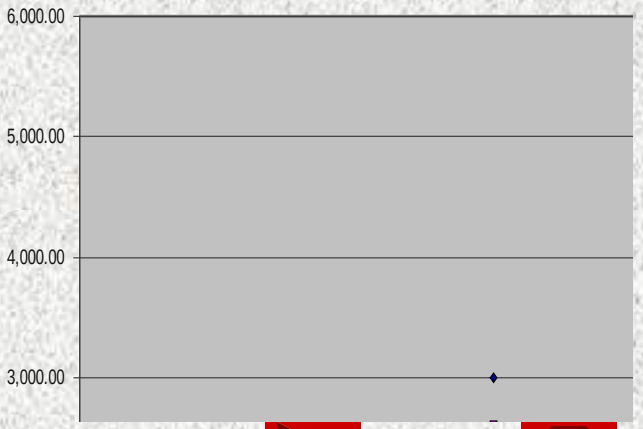
- Charts allow you to turn numbers into visual data.
- Pie charts may show proportions relative to the whole.
- Line charts may show trends or relationships over time.



The Spreadsheet:

- Use bar charts if data falls into a few categories.
- Use scatter charts to discover, rather than to display, a relationship between two variables.

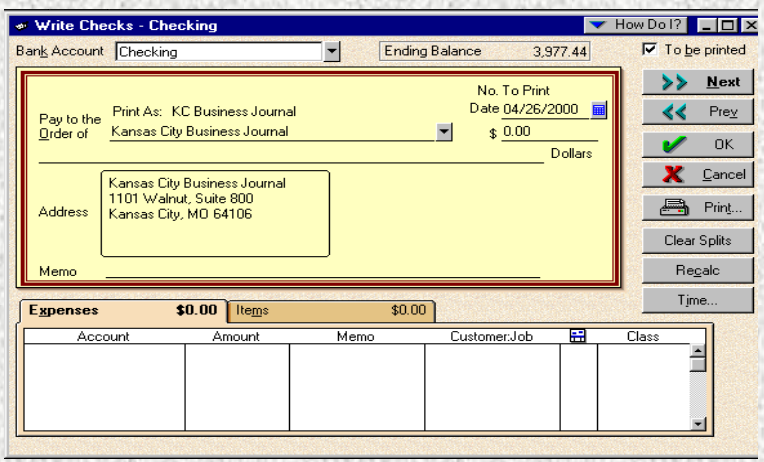




Statistical Software: Beyond Spreadsheets

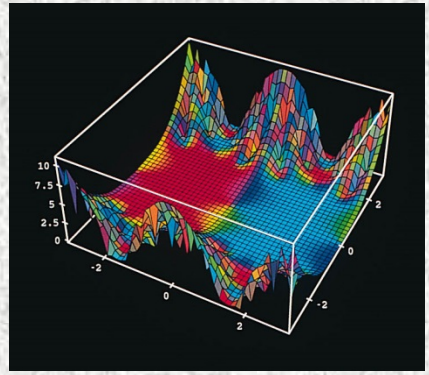
Money Managers

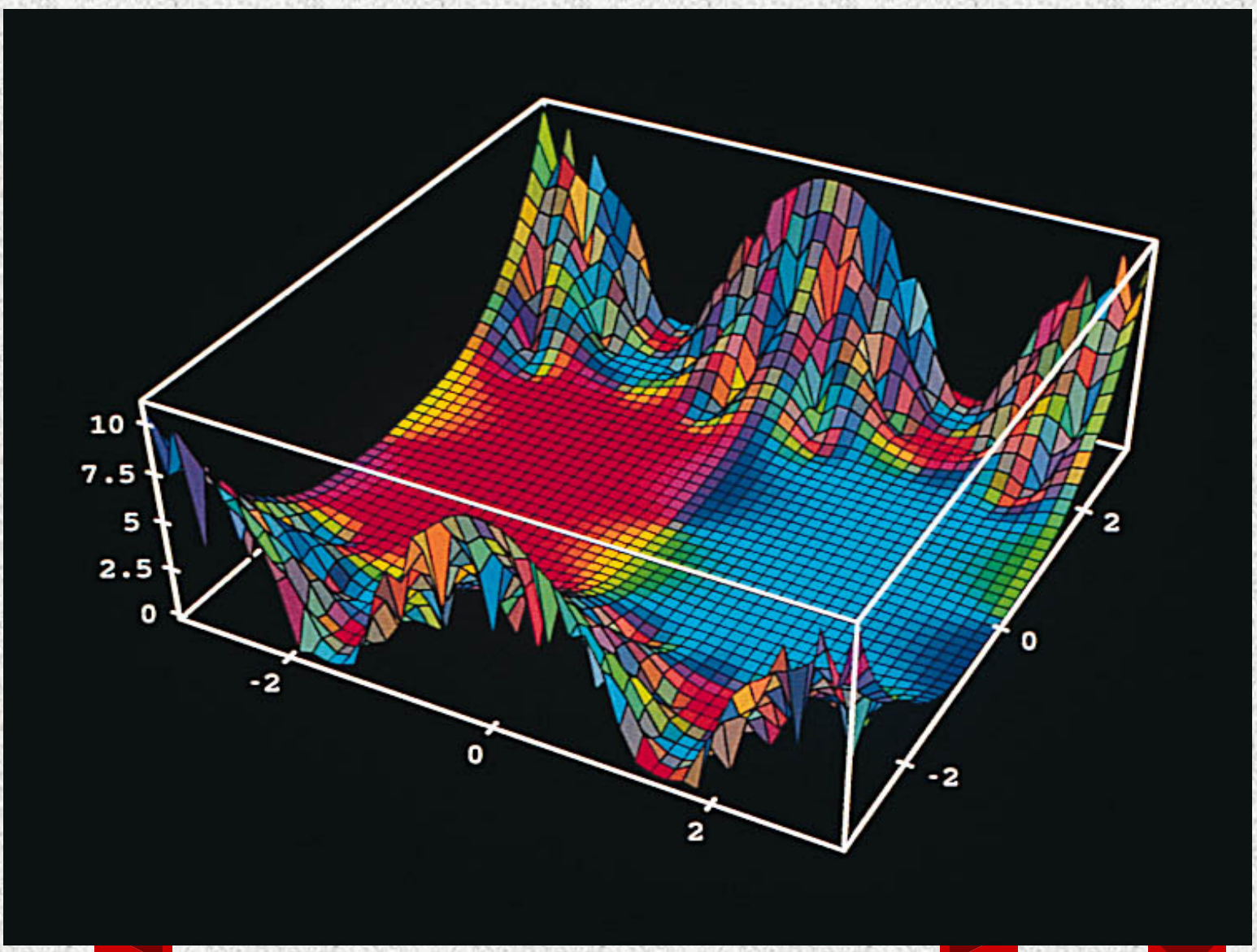
- **Accounting** and **Financial Management** software allows you to electronically handle routine transactions such as:
  - Writing checks
  - Balancing accounts
  - Creating budgets
  - Using online banking services
  - Preparing taxes



Computer Mathematics

- Mathematics processing software
  - Software may turn abstract mathematical relationships into visual objects (Example: Mathematica by Wolfram).





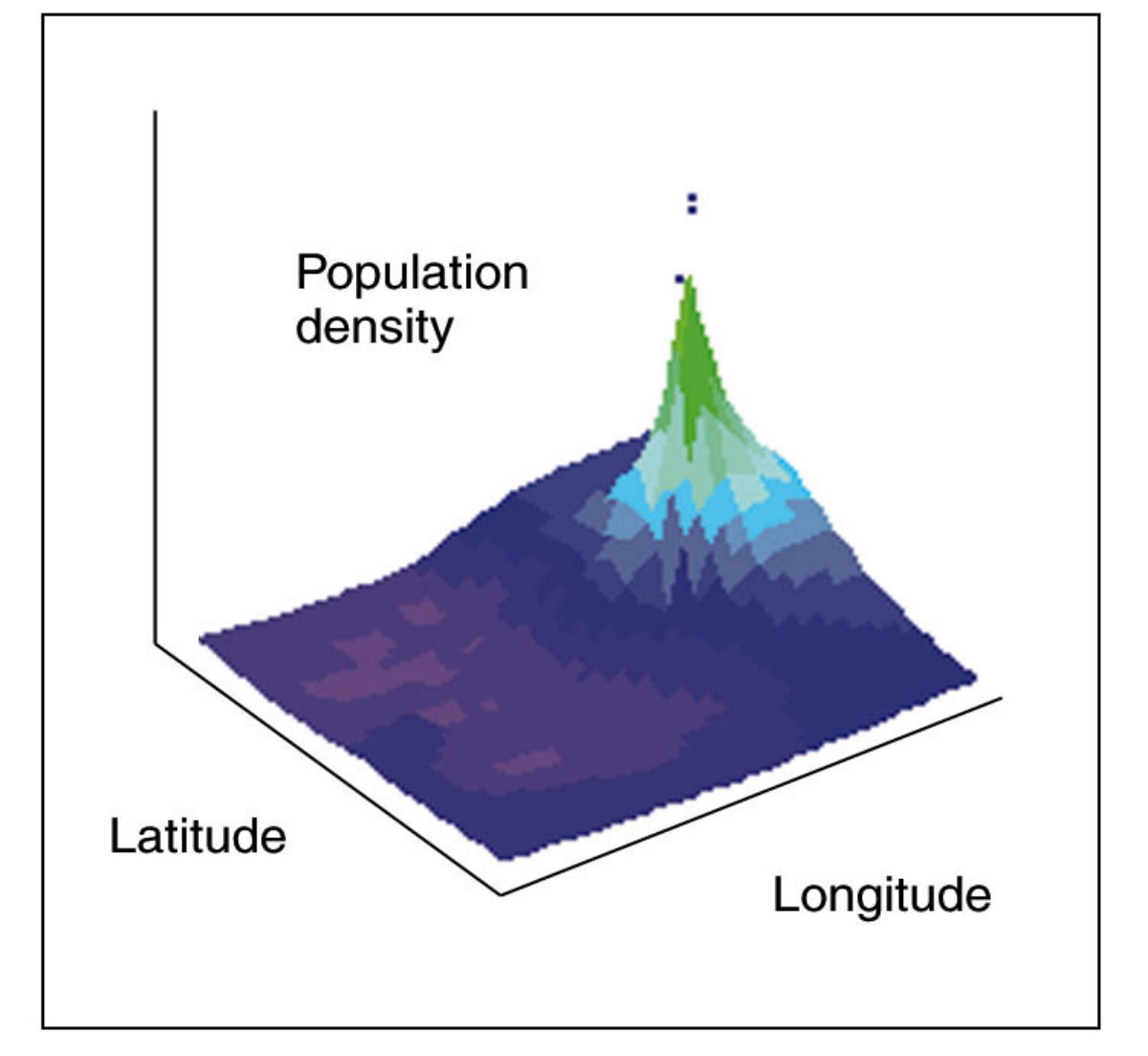
Statistical Software: Beyond Spreadsheets

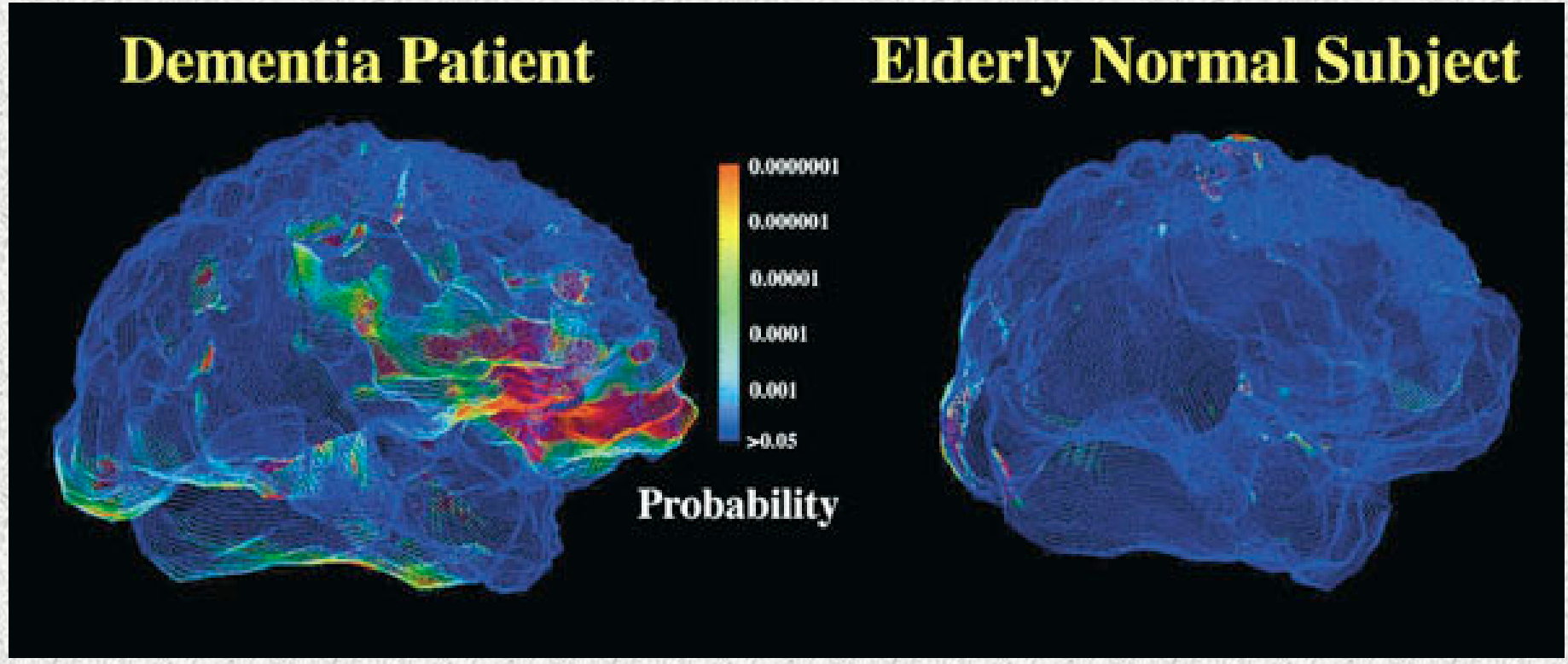
Statistics and Data Analysis

- Statistical and data analysis software
  - Collects and analyzes data that tests hypotheses
  - Can produce graphs showing how two or more variables relate to each other
  - Can uncover trends by browsing through two- and three-dimensional graphs of data.




Statistical Software: Beyond Spreadsheets





Calculated Risks: Computer Modeling and Simulation

Tomorrow's Technology and You 8/e
Chapter 5
Lesson Summary

- ✓ Even though the computer was designed to work with numbers, it can be an important tool for working with words as well.
- ✓ Word processing software enables you to use commands to edit text on screen, without having to retype messages.
- ✓ Outlining software, spell checkers, and online references can be very helpful.
- ✓ Desktop publishing produces professional-quality text-and-graphics documents.
- ✓ Spreadsheets can be used for tracking, calculating, forecasting, and almost any other task that involves repetitive numeric calculations. Most spreadsheet programs have charting capabilities.




Tomorrow's Technology and You 8/e
Chapter 5
Lesson Summary (continued)

- ✓ Specialized software allows you to perform accounting tasks, tax preparation, and a variety of business functions without the aid of spreadsheets.
- ✓ Symbolic mathematic and statistical-analysis software can help present data in meaningful ways.
- ✓ Scientific visualization software can help us understand relationships that are invisible to the naked eye.
- ✓ Computer modeling and simulation can be powerful tools for understanding the world and making better decisions.