

## Orthopedics

**Campbell's Operative Orthopaedics, vols 1-4**, edited by S. Terry Canale, 10th ed, 4283 pp, with illus, includes CD-ROM, \$495, ISBN 0-323-01240-X, St Louis, Mo, Mosby, 2003 (CD-ROM versions also available).

THE 10TH EDITION OF *CAMPBELL'S Operative Orthopaedics* bolsters the book's reputation as an important resource for musculoskeletal care. New editions of well-accepted reference textbooks sometimes seem merely to add irrelevant information to entice the reader to buy, buy, buy the newer version. While this edition of Campbell's may bring its publisher profits and its authors a measure of fame, it will also provide readers with essential, up-to-date information presented in a concise and efficient manner.

The well-respected team of 34 contributors includes 10 new authors, who ensure that the content remains current by incorporating important changes throughout. Orthopedic pathology, whether traumatic, congenital, or chronic is described in detail, often followed by several treatment options. Consequently, the information fills four volumes, a far cry from the original edition, and reflects how vastly our knowledge has grown since 1939. To help the reader find pertinent information quickly, each volume has a table of contents on its inner cover.

The two new chapters are "Amputation of the Hand" and "Diabetic Foot." Both wonderfully detail the surgical anatomy and the techniques to treat their respective pathology.

Surgical techniques are highlighted in this edition. I find the diagrams very helpful in illustrating and understanding the concepts presented in the text. For example, the eight pages devoted to surgical repair of medial knee compartment disruptions are complemented with seven figures.

This edition has split one former chapter into two: "Fractures of the Hip" now stands alone from "Fractures of the Acetabulum and Pelvis." This change highlights the importance of hip fractures in our society. These two chapters are extremely well presented and

worthy of review by all orthopedic surgeons who treat hip fractures.

I remain amazed that Dr Canale is able to compile this immense amount of information in a succinct and concise, user-friendly reference. The 10th edition of *Campbell's Operative Orthopaedics* remains an essential resource for the operative orthopedic surgeon.

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## NEW MEDIA

### Reference Software

**RefViz**, one CD-ROM, \$299.95, Carlsbad, Calif, Thomson ISIResearchSoft, 2003 (downloadable trial version available at <http://www.refviz.com>).

REFVIZ IS INFORMATION VISUALIZATION software; it detects and displays related concepts from a large universe of published scientific literature. Visualization automates the task of reading through massive new text, assimilating its contents, and then manually detecting unifying concepts. The history behind this development requires explanation.

Unsorted tonnage of information can be suffocating. Sifting and analysis are necessary to reduce this cognitive overload. The bioinformatics field came up with data-mining techniques for this purpose. Mining scans published literature, detects repetitively recurring word patterns, and determines their relationships. It then depicts iterative terms and themes in graphic form using trees, clusters, or branching diagrams. Clustering of unique but related text and data ease the tedium of individualized reading and cognitive analysis. One example is the *Visual Thesaurus* (<http://www.visualthesaurus.com/online/index.html>).

The mining-scan method has currency in bioinformatics and is diffusing into clinical informatics also.<sup>1,2</sup> Both public domain and commercial software enable rapid and reliable analysis of genomic and protein data. One such commercial program, *OmniViz* (<http://www.omniviz.com>), has been in use for a few years in basic sciences. *Ref-*

*Viz* (<http://www.refviz.com>) is a derivative product of *OmniViz*. It extends visualization application to other life science areas. This review evaluates its usefulness in clinical medicine.

Using a mathematical algorithm, *RefViz* analyzes already downloaded text from databases such as PubMed, Ovid (<http://www.ovid.com>) and Web of Knowledge (<http://www.isiwebofknowledge.com>). Initially, I downloaded tagged reference sets from PubMed, using free-text, truncated stem words, and Medical Subject Headings (MeSH) terms. I created both small and large files of 500 to 9999, or more, citations. These were in a familiar MEDLINE text format. My topics were directly clinical, eg, deep brain stimulation, magnetoencephalography, evidence-based medicine, hypothermia, and Agent Orange. I created larger files also on general topics, such as human evolution, genetics and neurological illness, single nucleotide polymorphism, self-reported health, research ethics, and Medicare policy and lobbying. File sizes ranged from 5 Mb to 9 Mb and took about 60 to 90 seconds for loading. Downloads did not require *RefViz*; they used openly available TCP/IP connections. *RefViz* would then process any of the above downloads to create secondary visualizable data sets. Processing took about 45 to 90 seconds. Both independent downloads and subsequent processing were always flawless.

*RefViz* displays its data in two multi-frame formats, one a "Galaxy," the other a "Matrix." Toggling between them is easy. Galaxy simulates a splattered night sky with rectangles and dots instead of stars and planets. Each rectangle with its surrounding dots represents a cluster of articles; all contain related concepts or key terms. A cluster is formed because there are sets of recurring key terms in articles. The terms are chosen by using the authors' own words and not specialized vocabulary. Proximity of different clusters reflects the degree of relationship among embedded concepts. A mouse-pause over each cluster displays a tab of contained key terms and the number of articles. A mouse-click brings out all articles in familiar

MEDLINE text format in a separate scroll-down frame. These, then, are the basics of visualization: a quick scan of clusters for major related concepts, and a cone-down, as needed, for in-depth scrutiny.

The Matrix has scrollable sidebar lists of key terms on the x- and y-axes. The axes can be cross-linked by selecting terms of interest. The intersect lines resemble vertical stacks of bricks of varying widths. The lines display key terms and numbers of articles at each intersect. An intersect looks like a brick within a stack. The articles are ranked on a relevance scale of -1.0 to +1.0. Besides Galaxy and Matrix, there are additional display frames listing all key terms, actual text of article titles, and an online help box. Key-term hierarchies are user controllable; a term may be promoted or demoted and the citations reprocessed for a different cluster display. An interacting thesaurus of terms is available; the user is able to add to its vocabulary.

Initially, I set aside the issue of clinical usefulness of the groupings during my learning exercises. I drew upon the valuable assistance of the technical staff of RefViz and OmniViz to facilitate my understanding. We ran one simultaneous real-time online distance-learning session to clear my doubts and to ensure that I was using the features of this product optimally.

To its credit, RefViz displayed groupings just as I would have anticipated. For instance it revealed deep brain stimulation (DBS), tremor, subthalamic nucleus, dystonia, Parkinson disease, and essential tremor as associated concepts in several clusters. Clusters were relevant and proximity of associations appropriate. Contained citations had acceptable relevance values. The cluster did reveal an association that I had forgotten: DBS and pain. This is because DBS had been a common erstwhile procedure for intractable pain. It is still used, but infrequently. This surprise association is a relevant finding for those unfamiliar with the past history of DBS. I had stumbled on other such appropriate, but looser, relationships. For example, Alzheimer disease mouse models came to light while

scanning through genetics of neurological diseases. The topic of research ethics highlighted an association between drug trials and industry sponsorship. There is much to learn about the best use of Matrix-Galaxy formats; however, skills-honing is easy, as the program is tolerant and flexible. Within a topic file, single terms and term combinations are also searchable. Chosen reference sets are exportable to full featured bibliographic managers from this vendor such as EndNote or ProCite.<sup>3</sup>

I downloaded 7500 citations on "human evolution" by limiting publications to the last 24 months. From this universe, RefViz detected and displayed many clusters that I could not have readily preconceived. For instance, the terms *disease evolution* and *natural history* clustered together, as did origins of *mitochondria* and *bacteria*. This swathe, while wide and educational, is of unknown merit. Unquestionably, it reveals associations of heuristic value, but it also clumps articles on *military history* and *cleft palate* because of an incidental uniting term *evolution*. Another key term, *csa*, pointed to articles about child sexual abuse, cyclosporine, and an accelerometer called *csa*. Author misspelling ("tumor" instead of "tremor") created an irrelevant inclusion. Thus, I did detect occasional inexplicable distracting relationships. Human winnowing is essential to increase specificity and reject unwarranted associations.

This brings us to the crucial question: are the issues of clinical medicine so broad and generic as to require the aid of clustering and hierarchical algorithms? Or, will our quests be answered better by focused searches using the power and versatility of free text, MeSH vocabulary, and PubMed's "Clinical Queries" and "Limits" options? Which method is better to answer common but important questions—for instance, benefit of endoscopic surgeries vs open surgeries, evidence underlying extracorporeal shock wave therapy for epicondylitis, or a summary of monoclonal antibody drugs? Do we need the brawn of automated text mining and visualization, or do we possess sufficient

background awareness to reach a focused conclusion through existing MEDLINE, Toxline, OMIM, or Internet utilities? Is PubMed's "Related Articles" option more revealing than the clustering by RefViz? These questions have not been answered by systematic, blinded, comparative studies. We should generate a series of common clinical health care questions and run simultaneous but separate retrieval experiments to compare the yields of text mining with existing search strategies for relevance and applicability. Such comparisons are essential in evaluating the efficacy of any new modality.

RefViz is a text visualization utility based on data-mining techniques from the field of bioinformatics. Its purpose is to ease the task of reading, comprehending, and detecting unifying concepts from voluminous data sets. It can reveal unsuspected conceptual relationships. Will it help us? When our biomedical quest is broad and diverse, this program will depict the results in visually comforting formats for further scanning and user-controlled detailed analysis. If a query is more specific and reliant on less disparate sources, as is likely to be the case in clinical sciences, focused searches of existing public domain databases will yield comparable and useful results. Academicians, life science researchers, and analysts will derive maximum benefits from this well-designed utility. Clinicians should familiarize themselves with this new concept; it has potential for major applications in bedside and clinical healthcare.

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