

# ॥क्रमपाठः॥

## **Kramapāṭha**

A Sanskrit reader for the sequential unfoldment of knowledge

## **Documentation**

Peter M. Scharf  
Department of Classics  
Brown University

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Sanskrit has been the principal culture-bearing language of India for more than three millennia. The manuscripts in Sanskrit number one hundred times those in Greek and Latin combined. Despite the abundance of its literature, there has been a dearth of material available for instruction beyond the first year in any medium. The Sanskrit Library's Independent-study Readers in Sanskrit Series publishes second-year Sanskrit reading materials based on classic stories of India. The Kramapāṭha electronic book distributes them to a world-wide audience across platform via the world wide web.

The editions of classic stories in this series contain besides the Devanāgarī text of each verse, sūtra, or sentence, its Roman transliteration, sandhi-analysis, Sanskrit prose paraphrase, syntactic and cultural notes, and an English translation. They also contain the identification of the inflection and stem or verbal root of each word, and the lexical categorization and translation of each stem, often providing in addition the stem's derivation and compound-analysis.

The Kramapāṭha electronic book allows the investigating student to unfold the information sequentially as needed. Displaying information about the verse in layers permits a student to attempt to achieve each level of analysis of the text himself before displaying that level of analysis to confirm or correct his suppositions. Kramapāṭha allows access to the information in layers keeping less analyzed information on display as more detailed information is called upon. The reader accesses levels of analysis of the text by using buttons and by clicking on items to learn more about them as detailed below using the text of the Rāmopākhyāna as an example.

## The Reader

One may launch the Kramapāṭha applet either by clicking on "Sanskrit Reader" under the heading "Tools" or by clicking on the title of a text on the Sanskrit Library Reading Room webpage. If one launches the applet by clicking on "Sanskrit Reader," one may select a book to open from the list at the right of the opening page. If one launches the applet by clicking on the title of a text, the applet launches displaying the title page of the selected book. To quit the applet and to return to the Sanskrit Library Reading Room webpage, simply hit the "Back" button on the browser. To proceed to another webpage, enter its URL. Quitting the browser also terminates the applet.

In general, pressing the carriage return has the same effect as clicking on the highlighted item. Highlighting is indicated in the program by placing a box around the item and reversing the shades, i.e. making the box black and the text white. Highlighting indicates that the item is recommended to be clicked and is selected automatically when the carriage return is pressed. Gray is used to indicate that a potentially active item is inactive, black, besides when used for text, is used to indicate that an active item is currently available, and blue, that an item otherwise differs from the ordinary black items on the screen, for example, the lines at the right under the heading "Display" appear blue when the item is being displayed in the Verse Window. Hitting the Escape key has the effect of clicking on a cancel button or of closing the window. The commands in the menu may be activated by pressing the mentioned key with or without the shift key.

When the Rāmopākhyāna is opened, a title page appears with a picture of Rāma, the title in Devanāgarī and Roman, and the subtitle (See diagram A4). At the top right of the screen are three buttons, a right arrow, a left arrow and a menu. The right arrow is highlighted. The left arrow ordinarily permits one to display the preceding verse but on the title page of the book appears gray and is disabled.

Clicking the right arrow, displays the Verse Window with the Devanāgarī text of the first verse (A5). The number of the verse appears in the upper right-hand corner of the Verse Window with the Mahābhārata numbering:

Mahābhārata 3.257.1

At the right of the screen, below the number, the right and left arrows, and the menu, is the text "Display." Below this and slightly indented are six lines indicating the textual material to be displayed in the Verse Window in the order it is to be displayed:

text  
 transliteration  
 sandhi analysis  
 Sanskrit paraphrase  
 notes  
 translation

In blue is indicated the current contents of the Verse Window; in reverse-shading, the contents to be added next either by clicking on it or by pressing the carriage return key. In black, items one may add by clicking on those text areas. In gray are the contents which cannot be added because the information is not available in the data files.

Clicking the highlighted line, "transliteration," displays the Roman transliteration just beneath the Devanāgarī in the Verse Window to permit comparison with the Devanāgarī (A6). Numbers, buttons and the six lines of text at the right remain constant in the Verse Window, except that the "transliteration" line is now blue and the "sandhi analysis" line, highlighted and will be clicked automatically if the return key is pressed.

Clicking the highlighted "sandhi analysis" line displays below the transliteration, for ease of comparison with it, the text restored to a form in which the words appear separated, without the phonetic adaptation known as *sandhi* (A7). The "sandhi analysis" line turns blue. Each word of the sandhi analysis in the display area is clickable. The first word is highlighted. No text line beneath the text "Display" appears highlighted but each remains clickable.

Clicking on any word in the analyzed sandhi text, including the highlighted word, in the display area displays a pop-up Grammar Window with the inflected word, the inflectional identification, and the word's stem in each of three rows (A8). (Pressing the carriage return has the effect of clicking on the highlighted word.) Clicking on the word or stem in the pop-up window displays the lexical information and translation in the two rows beneath the stem (A9). If there is derivational information for the stem, clicking on the word or stem in the pop-up window displays the derivational information in a box beneath the English translation of the stem (A10). Each row in the derivation box contains three items separated by a comma and a space: Sanskrit stem, lexical identification and English translation. Once all grammatical information available for a word has been displayed in the pop-up window. Clicking again on the word or stem or outside the Pop-up Grammar Window closes it. The next word becomes highlighted (A11). Upon display of the analyzed sandhi, pressing the return key will have the effect of clicking on each word in sequence one at a time and clicking on the word or stem in that word's pop-up grammar window to display its lexical category and English translation, to display derivational information, and to close it. If one interrupts the sequence by clicking on different item, the sequence resumes from the last item clicked. So if one clicks on the word 'hr̥tāyām' in diagram A8, the pop-up Grammar Window for hr̥tāyām opens and the sequence continues from there without returning to 'evam'.

Diagrams A12-A15 show the sequence of clicking on the word 'naravyāghrāḥ' out of sequence to display its grammatical information. Clicking the word opens a pop-up Grammar Window displaying the inflected word, its inflectional identification, and stem (A12). Clicking on the word or its stem in the pop-up window displays the stem's lexical category and English translation (A13). Clicking on the word or stem in the pop-up window again displays the stem's derivational information (A14), and clicking a final time closes the pop-up Grammar Window, as does clicking outside the Pop-up Grammar Window, and highlights the next word in sequence, namely, 'kim' (A15).

Diagrams A16-A18 show the sequence of clicking on another word for which the files do not contain derivational information. Clicking the verb 'akurvata' opens a Pop-up Grammar Window displaying the inflected word, its inflectional identification, and root (A16). Clicking on the word or verbal root in the pop-up window again displays the root's classification and English translation (A17). Since there is no derivational information, clicking on the word or root in the window closes it, as does clicking outside the Pop-up Grammar Window, and highlights the next word in sequence (A18).

Once the last word in the analyzed sandhi has been clicked and its Pop-up Grammar Window closed, the line "Sanskrit paraphrase" becomes highlighted. It will be clicked automatically if the return key is pressed. See diagram A19. The words of the analyzed sandhi in the display area of the Verse Window remain clickable throughout the rest of the displays for the verse allowing one to re-display their Grammar Windows. If one clicks on a word again, the sequence followed by the highlighting and CR's resumes from that word. It displays in sequence any item listed in black below the line "Display" subsequent to the Analyzed sandhi line always placing it in the order the items are listed there.

Even after seeing the grammatical information, a student may have difficulty construing the syntax of the verse. As a first aid to do so, Sanskrit prose sentences using the same vocabulary as in the verse may be displayed by clicking on the line "Sanskrit paraphrase" when black or highlighted. Clicking the "Sanskrit paraphrase" line displays prose Sanskrit sentences paraphrasing the verse below the already displayed verse, Roman transliteration, and analyzed sandhi (A20). The "Sanskrit paraphrase" line turns blue and the "notes" line becomes highlighted.

Clicking the "Notes" line displays notes explaining syntax, cultural references and any other relevant information not pertinent to individual words and thus already mentioned in a grammar window. The "notes" line turns blue and the "translation" line becomes highlighted (A21).

Clicking the "translation" line when black or highlighted, displays a close English translation of the verse. The display of information regarding a verse in the Verse Window is now complete. It includes the Devanāgarī verse, Roman transliteration, dissolved *sandhi*, prose equivalent, notes, and translation, each succeeding layer below the preceding. The "translation" line becomes blue and the right arrow at the tip right of the screen becomes highlighted (A22).

On a low precision screen, all this information may not fit in the display area. To display the text of the verse and its English translation together in the screen area, one can click on any line beneath the text "Display" to remove that item from the display area. Clicking the "transliteration," "Sandhi analysis," and "notes" lines turns these lines black and removes the items from the display area leaving displayed just the text of the verse in Devanāgarī, the prose sentences, and the English translation. This permits the viewer to see the three of them at once on the screen without scrolling up and down in the Verse Window. The right arrow remains highlighted and will be clicked automatically if the return key is pressed (unless one clicks such an item again to display it, in which case the sequence of highlighting and CRs will resume from the item just displayed. See diagram A23. Clicking the right arrow clears the Verse Window and begins the presentation of information regarding the next verse in the sequence just described for the present verse, displaying first the text in Devanāgarī script.

Any of the items to be displayed in the Verse Window may be added below the text of the verse by clicking on its descriptive line in black at any time. It may be removed at any time by clicking on its descriptive line in blue. The visual sequence of items in the Verse Window will remain that of the order listed at the right of the Options Window and in the order of the descriptive lines under "Display" at the right of the Verse Window. This implies, for example, that if the "transliteration" line is selected after the "Sanskrit paraphrase" line, the Roman transliteration will be displayed just below the text in place of the Sanskrit paraphrase and the Sanskrit paraphrase re-displayed below the Roman transliteration.

## I. Word boundary display

Moving the mouse over the text under any option at any time the Analyzed Sandhi is not displayed, displays red vertical lines marking the word boundaries (A24). Each word in the Devanāgarī text is clickable. Clicking a word opens a pop-up Grammar Window for that word (A25). A pop-up Grammar Window brought up by clicking on text invariably has the following three characteristics: 1) It displays grammatical information in the three step format described above including derivational information where it is available. 2) It invariably uses Devanāgarī script rather than Roman for the Sanskrit speech forms. 3) Unlike a grammar window brought up from the analyzed sandhi, it displays the inflected word with sandhi analyzed (in Devanāgarī script) inside it beneath the word in the text. Like a grammar window brought up from the analyzed sandhi, it includes the words inflectional identification, and its stem (in Devanāgarī script). Clicking on the word, on the word with sandhi analyzed or on the stem in the pop-up Grammar Window displays the lexical category and English translation of the word (A26). If there is derivational information regarding a word, clicking again on the word, on the word with sandhi analyzed or on the stem in the pop-up Grammar Window displays the derivational information of the word with the stems and roots in Devanāgarī script (A27). When all grammatical information has been displayed, clicking on the stem has no effect, clicking on the word or word with analyzed sandhi, or clicking outside the pop-up Grammar Window closes the window. If the mouse is over the text, the word boundaries remain visible, if not they vanish. Regardless of the stage of grammar display, when a pop-up Grammar Window is open clicking anywhere outside it closes it. When a grammar window opens, the highlight is removed from whatever is highlighted. Prior to the final stage of grammar display, hitting CR advances the grammar display until the grammar window closes. Once the grammar window closes, the highlight resumes its prior position.

## II. Clicking in Pop-up Grammar Windows

In any pop-up grammar window, clicking on the word or stem in a Pop-up Grammar Window, as has been described above, displays lexical categorization and English word-translation and derivational information if available. Shift-clicking on the inflectional identification or lexical categorization abbreviation expands the abbreviation to its unabbreviated text (A28).

## III. Options

The display of information described above is the most complete and detailed among a number of options. The options are chosen by selecting them in the Options Window. One opens the Options Window either by choosing "Options" from the Menu in the Verse Window or by pressing the O key.

Seven pre-packaged alternative sequences of information-display, titled to indicate the purpose the sequence is intended to serve, appear on buttons at the left of the Options Window. At the right of the Options Window appear various items to display in the Verse Window with check boxes to their left. A check in the box indicates that the item will be included in the display. If the check-box at the left is checked, Roman transliteration, Analyzed sandhi, Sanskrit paraphrase of verse, Notes, and English translation are provided with a check-box at their right, which if checked indicates that the item will be displayed upon the initial presentation of a Verse Window. Clicking a pre-packaged option

automatically checks the appropriate boxes at the right of the Options Window showing the items to be displayed, whether they are displayed initially and how Grammar boxes and Sanskrit will be displayed.

## A. Pre-Packaged Options

Each optional sequence begins by displaying at least the text of the verse in Devanāgarī in the Verse Window upon turning to a verse. A line describing each item to be displayed in the Verse Window under the option appears beneath the line "Display" at the right of the Verse Window. The line describing each displayed item appears in blue while the line describing the next item to be displayed is highlighted at each step with two exceptions: 1) The final step under each option highlights the right arrow. 2) The four options that include Grammar displays highlight the words in the Analyzed Sandhi beginning with the first word when Analyzed Sandhi is first presented and ending when the last word's grammar box is closed. Each option is described in particular below:

### 1. Devanāgarī Lesson (B2)

Text (C1)  
Roman transliteration (C2)  
English translation (C3)

Clicking the highlighted "transliteration" line in C1 adds Roman transliteration beneath the text of the verse in the Verse Window (C2). Clicking the highlighted "translation" line in C2 adds English translation beneath the Roman transliteration (C3).

### 2. Sandhi Lesson (B3)

Text and Roman transliteration (C4)  
Roman analyzed sandhi (C5)

The Text and Roman transliteration of the verse are displayed simultaneously immediately upon turning to a verse (C4). Clicking the highlighted "sandhi analysis" line in C4 adds Roman analyzed sandhi beneath them (C5). Although each of the words in the Analyzed Sandhi is clickable and clicking one will display the word's grammatical information in the three step display including derivation, no word is highlighted because it is not included in the default sequence; the right arrow is highlighted instead.

### 3. Casual Independent Study (B4)

Text (C6)  
Roman transliteration (C7)  
Roman analyzed sandhi (C8)  
Grammar Window: pop-up 2-step display without derivation (C9-C12)  
English translation (C13)

Clicking the highlighted "transliteration" line in C6 adds Roman transliteration beneath the text of the verse in the Verse Window (C7). Clicking the highlighted "translation" line in C7 adds English translation beneath the Roman transliteration (C8). Clicking a highlighted word in the analyzed sandhi lines opens the pop-up Grammar Window for that word and displays in it the inflected word in Roman script, its inflectional identification, and its stem in Roman script (C9). Clicking on



the word or stem in the highlighted pop-up Grammar Window displays the lexical category and English translation of the word (C10). No derivational information is displayed. Clicking again on the word or stem in the highlighted pop-up Grammar Window or anywhere outside the Pop-up Grammar Window closes it and highlights the next word (C11). No line beneath the line "Display" at the right of the Verse Window is highlighted until the pop-up Grammar Window of the last word in the analyzed sandhi has closed (regardless of whether other words are skipped or are clicked in sequence). Then the "translation" line becomes highlighted (C12). Upon clicking on the highlighted "translation" line in C12, English translation is added beneath the Roman analyzed sandhi and the right arrow is highlighted (C13).

#### 4. **Serious Independent Study (B1)**

Text (A5)  
 Roman transliteration (A6)  
 Roman analyzed sandhi (A7)  
 Grammar Window: pop-up 3-step display including derivation (A8-A18)  
 Sanskrit paraphrase of verse (A20)  
 Notes (A21)  
 English translation (A22)

This is the default option and is described in detail above.

#### 5. **University Reading Class (B5)**

Text (C14)  
 Sanskrit paraphrase of verse (C19)  
 Notes (C20)

(Word boundaries upon mouse over of text and pop-up grammar windows are shown in C15-18.) Clicking the highlighted "Sanskrit paraphrase" line in C14 adds Sanskrit paraphrase beneath the text of the verse in the Verse Window (C15). Clicking the highlighted "Notes" line in C19 adds Notes beneath the Sanskrit Paraphrase and highlights the right arrow (C20).

#### 6. **Advanced Review (B6)**

Text (C21)  
 Sanskrit paraphrase of verse (C24)

(Word boundaries upon mouse over of text and pop-up grammar windows are shown in C22-24.) Clicking the highlighted "Sanskrit paraphrase" line in C21 adds Sanskrit paraphrase beneath the text of the verse in the Verse Window and highlights the right arrow (C24).

#### 7. **Recitation Mode (B7)**

Text 5 verses at a time (C25)

The text of five verses is displayed at a time in the Verse Window. Only the remainder (of the number of verses in a chapter divided by five) is displayed at the end of a chapter. The first verse of a chapter is always the first in the display of five verses. Word boundaries upon mouse over of text and pop-up grammar windows are available as shown in C26.

## B. Custom Options

When the Options Window is opened, a radio-button is darkened and check-boxes appear checked showing the options currently in effect. The default is Serious Independent Study. If one selects another pre-packaged option, check-boxes are checked according to the features described above and shown in B1-7 and C1-26. One can then make any changes to the options by checking or unchecking the boxes on the right side of the window, or by clicking again on a pre-packaged option button (B8).

### 1. Verse Window Options

One may choose individually which of six possible items listed to display in the Verse Window and which to display initially. One may select any of the six, Text, Roman transliteration, analyzed sandhi, Sanskrit paraphrase, notes, and English translation, singly or multiply to appear in the Verse Window by clicking on the description of the item or in the check-box to its left. The check-box to the right of each of the five items does not appear if the check-box to the item's left is not checked.

### 2. Script

The option to choose Devanāgarī as the script in which to display the analyzed sandhi, and the Sanskrit speech forms in the Grammar Windows and Indices has not been implemented.

### 3. Grammar Window Options

The options not to include derivation and to display the Pop-up Grammar Windows in a single-step versus in multiple steps have not been implemented.

The Options window contains "O.K." and "Cancel" buttons at the lower right (B1). Choices are not "installed" until the Options Window is closed by pressing the highlighted "O.K." button or by pressing the return key. When the Options Window closes, the selected options are installed overriding previously selected options. Clicking the "Cancel" button closes the Options window leaving the options as they were before opening the Options window. Whether or not options have been changed, the Verse Window displayed prior to selecting the command refreshes to present its first display.

## IV. Menu

Clicking on "Menu" in the Verse Window displays a pop-up Menu with the items shown below. An item is selected by clicking on it. At the right are corresponding keyboard commands. The commands are divided into two groups: those that have to do with locating a verse in the book and those that don't. Items are grayed when disabled. D25 shows the Menu as it appears a few screens into the default sequence. Each command is discussed in detail below.

Table of Contents	C
Add Bookmark	B
Edit Bookmarks	E
Session History	H
IndexI	
-----	
Options	O
Play	P

## Close BookW

A menu command is enabled when black and disabled when gray as follows:

Table of Contents: never gray.  
 Add Bookmark: gray at title page.  
 View Bookmarks: gray at title page.  
 Session History: gray at title page.  
 Indices never gray.  
 Options: never gray.  
 Play gray at title page.  
 Close Book: never gray.

### A. Table of Contents

Selecting the "Table of Contents" menu item opens the Table of Contents Window (D3). A brief paragraph describes the structure of the text. A line illustrates the structure of the numbering of sections and verses or sūtras and ends with a box enclosed within parentheses which displays the range of numbers in the selected section. The list-box on the left beneath the section names contains all the sections compiled from the database. Selecting a section from the section list-box displays in the box in parentheses the range of numbers equal to the number of verses in the selected section. By default the current section is selected and the range of numbers in that section is shown in the box in parentheses. Opened from the title page, the default is the first section. The box on the right beneath the box in parentheses is typable. One can type the number of the verse or sūtra to which one wishes to turn. By default, the numeral one appears in the box and is selected so that by typing the number is replaced.

The window opens with the current chapter's line selected and the number of the current verse in the verse box. Selecting a new chapter resets the number to one. If opened from the title page, Mahābhārata 3.257 appears selected and number 1 appears in the number box. One may type any number in the range presented in the box. Pressing the carriage return key or clicking on the "turn to" button closes the Table of Contents Window and displays the selected verse in the Verse Window. Clicking the "Cancel" button closes the Table of Contents Window and returns to the Verse Window from which it was opened.

### B. Bookmarks

Bookmarks are set for Verse Windows currently displayed by selecting the "Add bookmark" Menu item from the Menu in the Verse Window or by pressing the B key (D4). Bookmarks are displayed in the order added in the Bookmarks Window and may be viewed by selecting the "Edit Bookmarks" Command from the Menu in the Verse Window or by pressing the E key. Entries for bookmarks appear in a list-box with the full section and verse number of the text as outlined in the table of contents. Clicking on the bookmark entry selects it and highlights it. The first bookmark in the list is selected by default. Three buttons appear at the lower right of the Window. Clicking the "Turn to" button displays the selected Verse Window. Clicking the "Cancel" button closes the Bookmarks Window without moving to the verse selected. Clicking the "Delete" button immediately deletes the highlighted bookmark from the Bookmarks Window (The deleted bookmark is not recovered even if the cancel button is later clicked).

Bookmarks are set in the Index for item highlighted in the list at the left of the Index Window by clicking on the Bookmark button at the right of the Index Window. Once an item is bookmarked, the Bookmark button turns gray. Clicking on the Show Bookmarks button opens the Bookmarks Window listing the bookmarks in alphabetic and numeric order placing numbers after characters. When an inflected form is bookmarked, it is listed in the Bookmarks Window after the stem whose inflected form it is, for example, "hṛtāyām" bookmarked is listed hṛta:hṛtāyām. Four buttons appear at the lower right of the Window. Clicking the "Turn to" button redisplay the Index Window with the bookmarked form highlighted in the listbox at the left. Clicking the "Close" button closes the Bookmarks Window without moving to the verse selected. Clicking the "Delete" button deletes the highlighted bookmark from the Bookmarks Window. Clicking the "Save" button opens a dialog box to save the bookmarks in an RTF file, named by default, "bookmarks.rtf," on the users computer. This feature requires that the user allow the applet unrestricted local privileges.

### C. Session History

Selecting the "Session History" Menu item opens the Session History Window (D5). The Session History Window looks and operates very much like the Bookmarks Window except that it lists recent Verse windows in which a grammar window was opened. The Session History Window is not editable and the order in which the items are presented is the order visited, i.e. most recent Window at the bottom of the list.

Two buttons appear at the lower right of the window. Clicking the "Turn to" button displays the selected Verse Window. Clicking the "Cancel" button closes the window and returns to the prior Window.

### D. Sound

Selecting the "Play" Command Menu item or pressing the "P" key in a Verse Window plays a sound file of the recitation of the verse.

## The Index

One launches the Index either from the Sanskrit Library Reading Room webpage by clicking on "Index" or from the Kramapāṭha Reader by clicking on "Index" in the Menu or pressing the "I" key (D6) [Not yet integrated with Malcolm's Index; still uses Ralph's separate Alphabetic and Sūtra indices]. In the latter case, the Index opens in a separate browser window. Other options for accessing the Index are described below in the section "Index access."

The Index contains a large list-box at the left with a type box beneath it, a smaller list-box in the center with a text-box beneath it, and a command area at the right. At the top of the command area a pull-down menu offers a choice of either an alphabetic index of stems occurring in the analysis of the text or a sūtra index of Pāṇinian sūtras referred to in the derivational analysis of these stems. Four check boxes offer various types of parameters by which to limit the contents of the large list-box. Three of four large buttons serve to display items related to the item highlighted in the large list-box and the fourth serves to return the list-box to its state prior to the display of these related items. Related items include derivative stems, inflectional forms, and the epithets of proper names. Four smaller buttons beside the text display area manage the index's interface.

By default, "alphabetic list" is selected in the pull-down menu and a list of all stems occurring in the text-analysis is displayed in the large list-box at the left in Sanskrit alphabetic order. The first of them is highlighted. The text-box displays information pertinent to the item highlighted in the large list-box. If that item is a stem (which may be an affix because the text-analysis often shows affixes as stem-entries in the subordinate derivation of a word), the text-box displays its lexical category and English translation (there is no English translation for affixes). If the item highlighted in the large list-box is an inflected form, the text-box displays inflectional identification, stem, lexical category and English translation. If the item is a Pāṇinian sūtra number and sūtra, the text-box displays the affix the sūtra provides or the type of compound the sūtra provides and its lexical category. The small list-box in the center of the Index Window displays the verse numbers of the verse in the analysis of which the selected item occurs. By default the first number at the top of the small list-box is selected [In Ralph's but not in Malcolm's].

### I. Limiting the index

One can display a subset of the complete list of stems or sūtras shown in the large list-box at the left of the Index Window by clicking on the check-box beside one or more of the following options:

- A. Un-analyzed stems
- B. Lexical categories
- C. Inflectional categories
- D. Verse range

Only the fourth is a valid option under the sūtra index. Under the alphabetic index selection of any of the four options is mutually compatible with selection of any other.

**A. Unanalyzed stems.**

Clicking on the check-box beside "Unanalyzed stems" limits the stems displayed in the large list-box to the unanalyzed stems of words actually occurring in the text. It excludes stems supplied by the derivational analysis of the vocabulary of the text, including compound elements.

**B. Lexical categories**

Clicking on the check-box beside "Lexical categories" opens the Lexical Categories Window (D7). At the left is a panel containing 12 lexical categories and a 13th option to view a list of the tags used to identify lexical categories. Each of the 13 items has a blender button at its left; selecting any one of them is mutually exclusive with selecting any other. Selecting a blender button shows the selected lexical category's subordinate categories in the panel at the right. By default the first category, "noun" is selected and its subcategories are displayed at the right with check-boxes at their left, all of which are checked indicating that all subcategories are selected. Clicking on any one of them deselects it if selected and selects it if deselected, without altering the selection of other subcategories. Below the check-boxes are buttons to select and to deselect all of them. Each of the other lexical categories 2-12 operates similarly (D8-D12). Some subcategories of the lexical categories for verb and c (compound) have subcategories themselves (D13-D14). These are not incompatible with selecting the other subcategories; one may select any combination of the subcategories. The lexical categories of preverb, onom, affix and augment do not have any subcategories (D16). The 13th option allows one to view the list of the tags used to identify lexical categories with the expansion of its abbreviation (D17). One may select any tag by clicking on it. If the cancel button is clicked, the Index Window is returned to unchanged. If the O.K. button is clicked, the list-box at the left displays the stems which have the selected lexical category tags.

**C. Inflectional categories**

Clicking on the check-box beside "Inflectional categories" opens the Inflectional Categories Window (D18) which operates similarly to the Lexical Categories Window. At the left is a panel containing 2 inflectional categories and a 3rd option to view a list of the tags used to identify inflectional categories. Each of the 3 items has a blender button at its left; selecting any one of them is mutually exclusive with selecting any other. Selecting a blender button shows the selected inflectional category's subordinate categories in the panel at the right. By default the first category, "nominal" is selected and its subcategories are displayed at the right with check-boxes at their left, all of which are checked indicating that all subcategories are selected. Clicking on any one of them deselects it if selected and selects it if deselected, without altering the selection of other subcategories. Below the check-boxes are buttons to select and to deselect all of them. The second inflectional category operates similarly (D19). One may select any combination of the subcategories. The 3rd option allows one to view the list of the tags used to identify inflectional categories (D20). One may select any tag by clicking on it. If the cancel button is clicked, the Index Window is returned to unchanged. If the O.K. button is clicked, the list-box at the left displays the stems which have the selected inflectional category tags.

**D. Verse range**

Clicking on the check-box beside "Text range", opens the Text Range Window (D21). One may select the beginning and ending verses in the range in the same manner as described for the Table of Contents. The default for the beginning of the range shown to the right of "From:" is the first section and verse, sūtra, or sentence of the text. The default for the end of the range shown to the right of "To:" is the last section and verse, sūtra, or sentence of the text. If the O.K. button is clicked, the Text Range Window closes and the Index Window displays in the large list-box the stems occurring in the selected range which have characteristics compatible with previously selected derivational, lexical, and inflectional limits.

**II. Displaying items related to the item selected in the large list box**

Clicking on any of the three large buttons labelled "Show..." as below serves to display items related to the item highlighted in the large list-box:

- A. Show derivative stems
- B. Show inflected forms
- C. Show epithets

These buttons appear gray whenever there are no items in the designated category related to the item highlighted in the large list-box at the left. The number of items related to the highlighted stem is shown in parentheses at the right of the button. Whenever any of these three "Show..." buttons is selected, the pull-down menu to switch indices and the commands to limit items in the large list-box turn gray and the "<-- Go back" button turns black. Clicking on the "<-- Go back" button returns the large list box, and the rest of the Index Window, to the state it had prior to clicking the "Show..." button.

**A. Derivative stems**

A stem is determined to have derivative stems if there are stems in the analyzed text whose derivation is traced to it. If the stem highlighted in the large list box at the left has derivative stems, the "Show Derivative stems" button appears black; otherwise it appears gray. Clicking on the button when black displays the stems immediate derivatives in the large list-box with the first in the list highlighted. The text-box at the bottom center of the Index Window displays the highlighted form's lexical category and English translation. A derivative stem may or may not itself have further derivative stems. If it does, the "Show derivative stem" button appears black; if not, gray.

**B. Inflected forms**

If the stem highlighted in the large list-box at the left has inflected forms which occur in the text, the "Show Inflected forms" button appears black. Clicking on it displays the inflected forms in the large list-box with first in the list highlighted. The text-box at the bottom center of the Index Window displays the highlighted form's inflectional identification, stem, lexical category, and English translation.

### C. Epithets

If the stem highlighted in the large list-box at the left is the proper name of a person or object referred to by epithets in the text, the "Show Epithets" button appears black. Clicking on it displays the epithets used to refer to that person or object in the text in the list-box at the left with first in the list highlighted. The text-box at the bottom center of the Index Window displays the highlighted form's lexical category and English translation. If there are no epithets referring to the person or object denoted by the stem highlighted in the large list-box at the left, the "Show Epithets" button appears gray.

## III. Pāṇinian sūtra index

Selecting "sūtra index" under the pull-down menu at the top of the command area of the Index displays a list of the Pāṇinian sūtras cited in the derivation of stems in the analysis of the text. Pāṇinian sūtras are cited in the lexical categorization of compounds and beside the Pāṇinian form of affixes which they provide after verbal roots and nominal stems to form derivatives. The affixes so provided are listed along with other posited speech forms such as stems and verbal roots in the large list-box under the alphabetic index. When the list of Pāṇinian sūtras first appears in the large list-box at the left of the Index Window, the first item in the list is highlighted by default. The text-box displays the whole contents of the field in which the sūtra number occurred in the text-analysis. Besides the sūtra number, this field includes either the affix, if the sūtra provides for the occurrence of an affix, or the lexical category with the identifier of the type of compound, if the sūtra provides for the formation of a compound.

The list of sūtras in the large list-box may be limited only by text range; the check-boxes of the other three types of limiting parameters appear gray. Clicking on the "Show derivatives" button displays a list of the stems immediately derived by provision of the sūtra in the large list-box at the left. For example, if the sūtra provides for the formation of a compound, the list-box displays the compound stems formed; if the sūtra provides that a *kṛt*-affix occurs after a verbal root, the list-box displays the primary derivatives formed from verbal roots with that affix.

## IV. Index access

Shift clicking on an inflectional identification, stem, lexical identification, or proper name in the English translation field of a Grammar Window or Derivation Window will select the relevant options in the Index Window if the Index is open or will open the Index in a separate browser window with the relevant options selected if it is not already open. Shift clicking on an inflectional identification will open the Index window with the same configuration as if the inflectional identification tag had been selected from the tag list in the Inflectional Categories Window (D20). Similarly, shift clicking on a lexical category in a Grammar or Derivation Window will open the Index window with the same configuration as if the lexical category tag had been selected from the tag list in the Lexical Categories Window (D17). Shift clicking on a stem will open the Index window with the stem highlighted in the large list-box.

When one selects a number in the list of passage numbers in the small list-box in the Index Window, the "Turn to" button at the lower right of the Index Window turns black. Clicking on it displays the passage in the Reader in a separate Window of the Browser. At any time one may return to the Index in the other browser Window in the state in which it was left.



[It may be necessary in some environments to open the Reader and the Index in separate browser windows and to open the corresponding book in each manually in order for them to interact as described. At present there is an index only for the Rāmopākhyāna.]

## V. Index Examples

### A. Verbal Roots

If one clicks on "Lexical categories" check-box under the heading "Limit to:" in D6, and clicks on the "verb" blender button, clicks on the "Clear All" button, and clicks on the "roots" check-box in D13, all subcategories of verbs are selected except those for absolutive and infinitive. If one then clicks, "O.K.", a list of all Verbal Roots occurring in the analysis of the text, including in the derivational analysis of stems, is displayed in the list-box at the left of the Index Window (D6) with, the first one, *ak* in the Rāmopākhyāna, highlighted. The smaller list-box at the center of the Index Window displays the verse number of the only verse in which the root is mentioned. If one clicks on the check-box beside "Unanalyzed stems," the large list-box displays only verbal roots conjugated forms of which occur in the text, excluding roots which occur only in the derivational analysis of stems. The first in the list, now *atikram*, appears highlighted. The small list-box now displays the number of the only verse in which a finite form of the verbal root *kram* preceded by the preverb *ati* occurs. If one types "kf" in the type-box at the foot of the large list-box, it displays the root *kr* highlighted in the middle with alphabetically neighboring roots above and below it. The small list-box displays the numbers of the verses containing conjugated forms of the verb *kr*. If one clicks on the "Bookmark" button, the current state of the Index will be saved in random access memory. If one clicks on the "Show Bookmarks" button, the Bookmarks Window opens displaying *kr*. Clicking the "Close" button closes the Bookmark Window. The "Show derivative stem" button contains the number 22 in parentheses indicating the number of verses in which a stem immediately derived from the root *kr* in the text-analysis occurs. Clicking on the button displays the list of derivates in the large list-box in alphabetic order with the first of them, *andhakāra*, highlighted. The small list-box shows the number of the verse in which the derivate occurs and the text-box shows its lexical category and translation. Clicking on *kr̥ta* in the alphabetic list of derivates highlights it and displays the numbers of the verses in which a declined form of it occurs. The text-box shows its lexical category and translation. The number 19 in parentheses on the "Show derivative stems" button indicates the number of verses in which immediate derivates of the past passive participle *kr̥ta* occur. The number 4 in parentheses on the "Show inflected forms" button likewise indicates that there are 4 verses in which a declined form of the past passive participle occurs. Clicking it will display the declined forms in alphabetic order in the large list-box with the first in the list, *kr̥taḥ*, highlighted and the numbers of the verses in which it occurs listed in the small list box. Clicking on the first number, 3.260.2, highlights it and turns the "Turn to" button black. Clicking the "Turn to" button makes the Reader display the verse. By bringing the Reader's browser window to the fore one may study the verse using the Reader program as described above. One may return to the Index by bringing its browser window to the fore. Clicking on the "Bookmark" button saves the current state of the Index. Clicking the "Show Bookmarks" button displays the Bookmarks Window in which *kr̥ta:kr̥taḥ* will be displayed beneath the previous bookmark entry *kr* which appears highlighted. Clicking the "Turn to" button restored the Index Window to the state in which *kr* was bookmarked.

The Index's Bookmarks Window is a separate browser window which may be closed or left open, moved, and re-accessed using the browser's "Window" menu. Clicking on the "Show Inflected forms" button displays the 18 conjugated forms of the verb *kr̥* in Sanskrit alphabetic order in the large list-box with the first, *akarot*, highlighted. The small list-box displays the numbers of the verses in which the form *akarot* occurs and the text-box shows its inflectional identifier, the root *kr̥*, and its lexical category and translation. If one selects *cakre* at the bottom of the list, it will be highlighted and its numbers will appear in the list-box. Clicking on the first number in the list and on the now black "Turn to" button will display the verse in the Verse Window of the Reader as described previously.

## B. Vocabulary Lists

The beginning of a complete vocabulary list of the text appears in the large list-box of a newly opened Index Window (D6). If one clicks on "Verse Range" under the heading, "Limit to:", the Verse Range Window opens (D21). One can select, for example, a range of several chapters to be covered in a semester, a single chapter, or a section of ten verses to be read for the next class. Clicking O.K. returns to the Index Window with the vocabulary list presented in the large list-box at the left. Clicking the "Save" command at the lower right of the Index Window will open a typical "Save" dialogue box with the title of the text followed by a hyphen, the word "glossary" and the RTF file-type designation, for example, "ramo-glossary.rtf." You can save the file if you have permitted your browser unrestricted access to your computer. The file will include each item in the large list-box on a line with the information in the text-box for each item in the list in tab-delimited fields to its right. The file will be in RTF format using ManjushreeCSX Font. It will include the header: <title> Index, copyright line, for example, "Rāmopākhyāna Index, © 2001 by Peter M. Scharf," and at the top of the list will indicate the date and time the file was created and the general parameters set in the Index to create it. For example:

Saved on Fri Jun 15 16:51:55 EDT 2001  
Lexical categories (verb...)

## Hardware and software requirements

### **I. Minimum screen size:**

Reader: 640x480 pixels  
Index: 800x600 pixels

### **II. Operating systems:**

Mac OS 7.5x and up  
Windows 95 and up  
Linux

### **III. Browsers:**

Netscape v. 4.06 under Windows  
Netscape v. 4.61 under MacOS.  
Internet Explorer v. 4