

File created: 5-May-87 15:24:37 {PHYLUM}<LISPUSERS>LYRIC>PLOTEXAMPLES.;1

changes to: (FNS HISTO.DRAW HISTPLOT MAKEBININTERVAL SCATPLOT SCAT.LOGSCALE LOGTICFN)

previous date: 18-Jun-86 12:50:08 {PHYLUM}<LISPUSERS>KOTO>PLOTEXAMPLES.;1

Read Table: INTERLISP

Package: INTERLISP

Format: XCCS

::
:: Copyright (c) 1986, 1987 by Xerox Corporation. All rights reserved.

(RPAQQ **PLOTEXAMPLESCOMS**

```
(( * * HISTOGRAM FNS)
 (FNS COMPUTEMULTIPLE HISTO.CHANGEBINS HISTO.COPYFN HISTO.DRAW HISTO.INTSCALEFN HISTO.INTTICFN
  HISTO.MAKEBINS HISTO.RESET HISTO.TICFN HISTO.VALUES HISTPLOT MAKEBININTERVAL
  SUMMARYWINDOW.REPAINTFN)
 (RECORDS BININTERVAL)
 (* * SCATTERPLOT FNS)
 (FNS SCATPLOT SCAT.LOGSCALE SCAT.POINTCOORDS SCAT.WORLDCOORD LOGTICFN)
 (* * Depends on PLOT)
 (FILES PLOT)
 (MACROS HISTO.GETFREQ HISTO.GETVALUE)
 (DECLARE%: DONTCOPY DONTEVAL@LOAD DOEVAL@COMPILE (LOCALVARS . T))))
```

(* * HISTOGRAM FNS)

(DEFINEQ

(**COMPUTEMULTIPLE**

[LAMBDA (MIN MAX INC MUTIPLE)

(* jop%: "25-Feb-86 12:15")

(* *)

```
(LET* [(NEWINC (TIMES INC MUTIPLE))
 (MINMULT (PLOT.FLOOR (QUOTIENT MIN NEWINC)))
 (MAXMULT (PLOT.CEILING (QUOTIENT MAX NEWINC))
 (create TICINFO
  TICMIN _ (TIMES MINMULT NEWINC)
  TICMAX _ (TIMES MAXMULT NEWINC)
  TICINC _ NEWINC
  NTICS _ (ADD1 (DIFFERENCE MAXMULT MINMULT]))
```

(**HISTO.CHANGEBINS**

[LAMBDA (HISTOGRAM)

(* jop%: "27-Feb-86 15:05")

(* * Allow the use to specify a range and a bin interval for the histogram)

```
(PROG ((PLOTWINDOW (PLOTPROP HISTOGRAM 'PLOTWINDOW))
 (INTFLG (PLOTPROP HISTOGRAM 'INTFLG))
 (BININTERVAL (PLOTPROP HISTOGRAM 'BININTERVAL))
 INC START END NBINS)
 (SETQ INC (fetch (BININTERVAL BININC) of BININTERVAL))
 (SETQ START (fetch (BININTERVAL BINMIN) of BININTERVAL))
 (SETQ END (fetch (BININTERVAL BINMAX) of BININTERVAL)) (* have a dialogue with the user)
 (TERPRI PLOTWINDOW)
 [SETQ START (READ (OPENSTRINGSTREAM (PROMPTFORWARD "From " START "Type start point of bin sequence"
  PLOTWINDOW))
 (SETQ START (if INTFLG
  then (PLOT.FLOOR START)
  else (FLOAT START)))
 [SETQ END (READ (OPENSTRINGSTREAM (PROMPTFORWARD " to " END "Type end point of bin sequence"
  PLOTWINDOW))
 (SETQ END (if INTFLG
  then (PLOT.CEILING END)
  else (FLOAT END)))
 [SETQ INC (READ (OPENSTRINGSTREAM (PROMPTFORWARD " by " INC "Type an increment" PLOTWINDOW))
 (SETQ INC (if INTFLG
  then (PLOT.CEILING INC)
  else (FLOAT INC)))
 (SETQ NBINS (PLOT.CEILING (FQUOTIENT (DIFFERENCE END START)
  INC)))
 (SETQ END (PLUS START (TIMES INC NBINS)))
 (if INTFLG
  then (SETQ NBINS (ADD1 NBINS))) (* Inform the user of what will happen)
 (PLOTWINDOW (CONCAT "Using: from " START " to " END " by " INC)
 HISTOGRAM)
 (PLOTWINDOW HISTOGRAM 'BININTERVAL
 (create BININTERVAL
  BINMIN _ START
  BINMAX _ END
```

```
(ADJUSTSCALE? [create EXTENT
MINX _ BINMIN
MAXX _ BINMAX
MINY _ 0
MAXY _ (CDR (for BIN in BINS largest (CDR BIN] (* Construct the new image)
HISTOGRAM)
(RESETLST
[RESETSAVE (FLTFMT ' (FLOAT NIL NIL NIL NIL 5] (* Round to five significant figures)
(RESETSAVE PRXFLG T)
(bind RECTANGLE LOWMARK HIGHMARK FREQ for BIN in BINS
do (SETQ HIGHMARK (CAR BIN))
(SETQ LOWMARK (DIFFERENCE HIGHMARK BININC))
(SETQ FREQ (CDR BIN))
(SETQ RECTANGLE (PLOTFILLEDRECTANGLE HISTOGRAM LOWMARK 0 BININC FREQ
(COND
[INTFLG (LET ((ILOWMARK (PLOT.CEILING LOWMARK))
(IHIGHMARK (PLOT.FLOOR HIGHMARK)))
(COND
((IEQP ILOWMARK IHIGHMARK)
(CONCAT FREQ " Obs. at " ILOWMARK))
(T (CONCAT FREQ " Obs. between " ILOWMARK " and "
IHIGHMARK]
(T (CONCAT FREQ " Obs. between " LOWMARK " and " HIGHMARK)))
SHADE NIL 'BINMENU T))
(PLOTOBJECTPROP RECTANGLE 'FROMHISTOGRAM? T)
(PLOTOBJECTPROP RECTANGLE 'LOWMARK LOWMARK)
(PLOTOBJECTPROP RECTANGLE 'HIGHMARK HIGHMARK))) (* Rescale the Histogram)
(RESCALEPLOT HISTOGRAM 'BOTH T) (* refresh the image)
(REDRAWPLOTWINDOW HISTOGRAM])
```

(HISTO.INTSCALEFN

```
[LAMBDA (MIN MAX TICINFO)                                     (* jop%: "24-Feb-86 23:29")
  (with TICINFO TICINFO (create AXISINTERVAL
                                MIN _ (DIFFERENCE TICMIN 0.5)
                                MAX _ (PLUS TICMAX 0.5]))
```

(HISTO.INTTICFN

```
[LAMBDA (MIN MAX)                                             (* jop%: "12-Feb-86 22:38")
```

```
  (* *)
```

```
  (LET* ((INTMAX (PLOT.FLOOR MAX))
         (INTMIN (PLOT.CEILING MIN))
         (TICINFO (DEFAULTTICFN INTMIN INTMAX))
         (NEWMAX (NEWMIN INC NTICS))
         [SETQ NEWMIN (IMIN INTMIN (PLOT.CEILING (fetch (TICINFO TICMIN) of TICINFO)
         (SETQ INC (PLOT.CEILING (fetch (TICINFO TICINC) of TICINFO)))
         [SETQ NTICS (ADD1 (PLOT.CEILING (FQUOTIENT (DIFFERENCE INTMAX NEWMIN)
                                                    INC]
         [SETQ NEWMAX (IPLUS NEWMIN (ITIMES INC (SUB1 NTICS))
         (create TICINFO
                 TICMIN _ NEWMIN
                 TICMAX _ NEWMAX
                 TICINC _ INC
                 NTICS _ NTICS))
```

(HISTO.MAKEBINS

```
[LAMBDA (HISTOGRAM)                                           (* jop%: "24-Feb-86 23:07")
```

```
  (* * Computes a BIN interval and the BINEDNUMBERS based on PLOT props.)
```

```
  (PROG ((OBATCH (PLOTPROP HISTOGRAM 'OBATCH))
         (BININTERVAL (PLOTPROP HISTOGRAM 'BININTERVAL))
         (INTFLG (PLOTPROP HISTOGRAM 'INTFLG))
         (NBINS MARKS BINEDNUMBERS)
         (if (NULL BININTERVAL)
             then (SETQ BININTERVAL (MAKEBININTERVAL (HISTO.GETVALUE (CAR OBATCH))
                                                       (HISTO.GETVALUE (CAR (LAST OBATCH)))
                                                       (PLOTPROP HISTOGRAM 'NBINS)
                                                       (INTFLG))) (* MARKS is a list of the NBINS plus 1 bin end points)
             )
         (SETQ NBINS (fetch (BININTERVAL NBINS) of BININTERVAL))
         (SETQ MARKS (LET ((BINMIN (fetch (BININTERVAL BINMIN) of BININTERVAL))
                          (BINMAX (fetch (BININTERVAL BINMAX) of BININTERVAL))
                          (BININC (fetch (BININTERVAL BININC) of BININTERVAL)))
                          (if INTFLG
                              then (SETQ BINMIN (DIFFERENCE BINMIN 0.5))
                              (SETQ BINMAX (PLUS BINMAX 0.5)))
                          (NCONC1 (for I from 1 to NBINS as MARK from BINMIN by BININC collect MARK)
                                BINMAX)))
```

```
  (* BINEDNUMBERS is a list of numbers, one for each bin, so that each entry is the number of elements of BATCH that fall in that bin)
```

```
  [SETQ BINEDNUMBERS (bind (NUMBERS _ OBATCH) for MARK in (CDR MARKS)
                           collect (bind NUM eachtime (SETQ NUM (CAR NUMBERS))
                                   while (AND NUMBERS (LESSP (HISTO.GETVALUE NUM)
                                                                MARK))
                                   sum (SETQ NUMBERS (CDR NUMBERS))
                                   (HISTO.GETFREQ NUM]
  (PLOTPROP HISTOGRAM 'BININTERVAL BININTERVAL)
  (PLOTPROP HISTOGRAM 'BINEDNUMBERS BINEDNUMBERS)
  (PLOTPROP HISTOGRAM 'MARKS MARKS])
```

(HISTO.RESET

```
[LAMBDA (HISTOGRAM)                                           (* jop%: "27-Feb-86 15:06")
```

```
  (* * Resets the range and bin interval to their original values)
```

```
  (PLOTPROP HISTOGRAM 'BININTERVAL NIL)
  (HISTO.DRAW HISTOGRAM])
```

(HISTO.TICFN

```
[LAMBDA (MIN MAX HISTOGRAM)                                   (* jop%: "25-Feb-86 12:43")
```

```
  (* *)
```

```
  (LET* ((RANGE (DIFFERENCE MAX MIN))
         (BININTERVAL (PLOTPROP HISTOGRAM 'BININTERVAL))
         (BININC (fetch (BININTERVAL BININC) of BININTERVAL))
         (NBINS (fetch (BININTERVAL NBINS) of BININTERVAL))
         (bind (MININTERVALLENGTH _ MAX.FLOAT)
```

```

MININTERVAL INTERVAL INTERVALLENGTH for MULTIPLE from (PLOT.CEILING (QUOTIENT RANGE
(TIMES BININC 9)))
to (PLOT.CEILING (QUOTIENT RANGE BININC)) do (SETQ INTERVAL (COMPUTEMULTIPLE MIN MAX BININC
MULTIPLE))
(SETQ INTERVALLENGTH (fetch (TICINFO TICINTERVALLENGTH)
of INTERVAL))
(if (LESSP INTERVALLENGTH MININTERVALLENGTH)
then (SETQ MININTERVAL INTERVAL)
(SETQ MININTERVALLENGTH INTERVALLENGTH))

finally (RETURN MININTERVAL))

```

(HISTO.VALUES

```

[LAMBDA (RECTANGLE HISTOGRAM) (* jop%: "24-Feb-86 23:25")
(PROG [(SUMMARYWINDOW (WINDOWPROP (PLOTPROP HISTOGRAM 'PLOTWINDOW)
'SUMMARYWINDOW))
(LOWMARK (PLOTOBJECTPROP RECTANGLE 'LOWMARK))
(HIGHMARK (PLOTOBJECTPROP RECTANGLE 'HIGHMARK))
(OBATCH (PLOTPROP HISTOGRAM 'OBATCH)
(COND
(NULL SUMMARYWINDOW) (* Make a window five chars high)
(SETQ SUMMARYWINDOW (CREATEW (CREATEREGION 0 0 100 (HEIGHTIFWINDOW
(ITIMES 5 (FONTPROP (DEFAULTFONT 'DISPLAY)
'HEIGHT))
T))
"SUMMARY WINDOW" NIL T)) (* Supply a simple repaintfn)
(WINDOWADDPROP SUMMARYWINDOW 'REPAINTFN (FUNCTION SUMMARYWINDOW.REPAINTFN))
(WINDOWADDPROP SUMMARYWINDOW 'RESHAPEFN (FUNCTION SUMMARYWINDOW.REPAINTFN))
(WINDOWPROP (PLOTPROP HISTOGRAM 'PLOTWINDOW)
'SUMMARYWINDOW SUMMARYWINDOW)) (* cache the output as a window prop)
(WINDOWPROP SUMMARYWINDOW 'OUTPUT (bind NUM for ITEM in OBATCH eachtime (SETQ NUM (HISTO.GETVALUE ITEM))
when (AND (GEQ NUM LOWMARK)
(LESSP NUM HIGHMARK))
collect ITEM)) (* If the window is not yet attached, then attach it)
(COND
((NOT (OPENWP SUMMARYWINDOW))
(ATTACHWINDOW SUMMARYWINDOW (fetch PLOTWINDOW of HISTOGRAM)
'TOP NIL 'LOCALCLOSE))
(T (SUMMARYWINDOW.REPAINTFN SUMMARYWINDOW]))

```

(HISTPLOT

```

[LAMBDA (BATCH LABEL SHADE) (* jop%: "27-Feb-86 22:55")

(* * Batch is assumed to be a list of numbers or a list of pairs (number . frequency) Label, a label to be associated with those
numbers)

(PROG ((HISTOGRAM (CREATEPLOT))
(BINMENU (LIST (LIST 'Values (FUNCTION HISTO.VALUES)
"Output values in bin")))
[RIGHTMENUITEMS (LIST (LIST 'Change% bins (FUNCTION HISTO.CHANGEBINS)
"Change number of bins"
(LIST 'SUBITEMS (LIST 'RESET (FUNCTION HISTO.RESET)
"Reset range and bin interval to original value"]
(LEFTTLABEL "Frequency")
(BOTTOMLABEL (OR LABEL "Values")))
(N (for ITEM in BATCH sum (HISTO.GETFREQ ITEM)))
(TOPLABEL (COND
(LABEL (CONCAT "Histogram of " LABEL))
(T "Histogram"))))
OBATCH INTFLG NBINS)

(* * BINMENU is a special menu for the rectangle of the histogram.
RIGHTMENUITEMS are additional right menu items.)

[SETQ OBATCH (SORT (COPY BATCH)
(FUNCTION (LAMBDA (X Y)
(LESSP (HISTO.GETVALUE X)
(HISTO.GETVALUE Y))
(* Order the data)
[SETQ INTFLG (for X in OBATCH always (FIXP (HISTO.GETVALUE X)
(* check if data are all integers)
[SETQ NBINS (COND
[INTFLG (ADD1 (DIFFERENCE (HISTO.GETVALUE (CAR (LAST OBATCH)))
(HISTO.GETVALUE (CAR OBATCH)
(T (COND
[ (LESSP N 20)
(FIX (TIMES 2 (SQRT N)
(T (FIX (TIMES 10 (PLOT.LOG10 N] (* Default number of bins set by an heuristic)
(* Set up a few key PLOT PROPS)

(PLOTPROP HISTOGRAM 'N N)
(PLOTPROP HISTOGRAM 'NBINS NBINS)
(PLOTPROP HISTOGRAM 'OBATCH OBATCH)
(PLOTPROP HISTOGRAM 'INTFLG INTFLG)
(PLOTPROP HISTOGRAM 'SHADE (OR SHADE SHADE3)) (* Function to copy the plot props)
(PLOTPROP HISTOGRAM 'COPYFN (FUNCTION HISTO.COPYFN)) (* Initialize the histogram so that labels and tics are displayed)

```

```

(PLOTTICS HISTOGRAM 'BOTTOM T T)
(PLOTTICS HISTOGRAM 'LEFT T T)
(PLOTLABEL HISTOGRAM 'BOTTOM BOTTOMLABEL T)
(PLOTLABEL HISTOGRAM 'LEFT LEFTLABEL T)
(PLOTLABEL HISTOGRAM 'TOP TOPLABEL T)
(PLOTADDMENUITEMS HISTOGRAM 'RIGHT RIGHTMENUITEMS) (* add items to the right menu)
(PLOTMENUITEMS HISTOGRAM 'BINMENU BINMENU) (* Establish a special "bin" menu)
[COND
  (INTFLG (PLOTTICFN HISTOGRAM 'X (FUNCTION HISTO.INTTICFN))
    (PLOTSCALEFN HISTOGRAM 'X (FUNCTION HISTO.INTSCALEFN)))
  (T (PLOTTICFN HISTOGRAM 'X (FUNCTION HISTO.TICFN) (* Draw the histogram based on the PLOT PROP's)
    (HISTO.DRAW HISTOGRAM) (* Returns a PLOT)
    (RETURN HISTOGRAM))])

```

(MAKEBININTERVAL

```
[LAMBDA (BATCHMIN BATCHMAX NBINS INTFLG) (* jop%: "25-Feb-86 12:48")
```

```
(* *)
```

```

(COND
  [INTFLG (LET ((NINT (ADD1 (IDIFFERENCE BATCHMAX BATCHMIN)))
    MULT)
    (COND
      ((IGEQ NBINS NINT)
        (create BININTERVAL
          BINMIN _ BATCHMIN
          BINMAX _ BATCHMAX
          BININC _ 1
          NBINS _ NINT))
      (T (SETQ MULT (PLOT.CEILING (FQUOTIENT (DIFFERENCE BATCHMAX BATCHMIN)
        NBINS)))
        (create BININTERVAL
          BINMIN _ BATCHMIN
          BINMAX _ (PLUS BATCHMIN (TIMES MULT NBINS))
          BININC _ MULT
          NBINS _ NBINS)]
    (T (LET [(TICINFO (SCALE BATCHMIN BATCHMAX (ADD1 NBINS)
      (create BININTERVAL
        BINMIN _ (fetch (TICINFO TICMIN) of TICINFO)
        BINMAX _ (fetch (TICINFO TICMAX) of TICINFO)
        BININC _ (fetch (TICINFO TICINC) of TICINFO)
        NBINS _ NBINS)]

```

(SUMMARYWINDOW.REPAINTFN

```
[LAMBDA (WINDOW) (* jop%: "12-May-85 14:40")
```

```
(* * PRIN1 whatever happens to be under the OUTPUT PROP)
```

```

(PROG [(OUTPUT (WINDOWPROP WINDOW 'OUTPUT)
  (CLEARW WINDOW)
  (printout WINDOW OUTPUT T])

```

```
)
```

```
(DECLARE%: EVAL@COMPILE
```

```

(RECORD BININTERVAL (BINMIN BINMAX BININC NBINS))
)

```

```
(* * SCATTERPLOT FNS)
```

```
(DEFINEQ
```

(SCATPLOT

```
[LAMBDA (Y X POINTLABELS YLABEL XLABEL TITLE SYMBOL) (* jop%: "26-Feb-86 12:44")
```

```
(* * X and Y are equal length list of numbers, or X is NIL)
```

```

(COND
  ((NULL X)
    (SETQ X (for I from 1 to (LENGTH Y) collect I)))
  ((NOT (EQLLENGTH Y (LENGTH X)))
    (HELP "X and Y must be of equal length")))
[COND
  ((NULL TITLE)
    (SETQ TITLE (COND
      ((AND XLABEL YLABEL)
        (CONCAT "Scatterplot of" YLABEL " vs " XLABEL))
      (T "Scatterplot"))
    (COND
      ((NULL SYMBOL)
        (SETQ SYMBOL STAR)))
    (LET* [(SCATPLOT (CREATEPLOT))
      [RIGHTMENUITEMS ' ((Logscale SCAT.LOGSCALE "Toggle exponential tics" (SUBITEMS

```

(SCAT.LOGSCALE

(SCAT.POINTCOORDS

```

[LAMBDA (POINTOBJECT SCATTERPLOT) (* jop%: "20-Jan-86 21:18")
  (PROG ([POINTPOSITION (fetch (POINTDATA POINTPOSITION) of (PLOTBJECTPROP POINTOBJECT 'OBJECTDATA)]
    (XLABEL (CONCAT (OR (PLOTLABEL SCATTERPLOT 'BOTTOM)
      "XCOORD")
      " ")))
    (YLABEL (CONCAT " " (OR (PLOTLABEL SCATTERPLOT 'LEFT)
      "YCOORD")
      " ")))
  (PLOTPROMPT (CONCAT XLABEL (PLOT.WORLDTOLABEL (fetch XCOORD of POINTPOSITION)
    SCATTERPLOT
    'X)

```

```

        YLABEL
        (PLOT.WORLDTOLABEL (fetch YCOORD of POINTPOSITION)
          SCATTERPLOT
            'Y))
    SCATTERPLOT))

```

(SCAT.WORLDCOORD

```

[LAMBDA (SCATTERPLOT)
  (PROG ((PLOTWINDOW (PLOTPROP SCATTERPLOT 'PLOTWINDOW))
    (PLOTWINDOW (PLOTPROP SCATTERPLOT 'PLOTWINDOW))
    (PLOTVIEWPORT (PLOTPROP SCATTERPLOT 'PLOTWINDOWVIEWPORT))
    (XLABEL (CONCAT (OR (PLOTLABEL SCATTERPLOT 'BOTTOM)
      "X")
      " at ")))
    (YLABEL (CONCAT " " (OR (PLOTLABEL SCATTERPLOT 'LEFT)
      "Y")
      " at ")))
    (OLDCURSPOS (CONSTANT (create POSITION
      XCOORD _ 0
      YCOORD _ 0)))
    (NEWCURSORPOS (CONSTANT (create POSITION)))
    STARTXCOORDX STARTXCOORDY STARTYCOORDX STARTYCOORDY)
    (PRINTOUT PLOTWINDOW T XLABEL)
    (SETQ STARTXCOORDX (DSPXPOSITION NIL PLOTWINDOW))
    (SETQ STARTXCOORDY (DSPYPOSITION NIL PLOTWINDOW))
    (PRINTOUT PLOTWINDOW .SP 10 YLABEL)
    (SETQ STARTYCOORDX (DSPXPOSITION NIL PLOTWINDOW))
    (SETQ STARTYCOORDY (DSPYPOSITION NIL PLOTWINDOW))
    (while (MOUSESTATE UP) do (SETQ NEWCURSORPOS (CURSORPOSITION NIL PLOTWINDOW NEWCURSORPOS))
      (if [NOT (AND (EQP (fetch XCOORD of OLDCURSPOS)
        (fetch XCOORD of NEWCURSORPOS))
        (EQP (fetch YCOORD of OLDCURSPOS)
        (fetch YCOORD of NEWCURSORPOS))
      then (MOVETO STARTXCOORDX STARTXCOORDY PLOTWINDOW)
        (PRINTOUT PLOTWINDOW .F10.4 (STREAMTOWORLDX (fetch XCOORD
          of NEWCURSORPOS)
            PLOTVIEWPORT))
        (MOVETO STARTYCOORDX STARTYCOORDY PLOTWINDOW)
        (PRINTOUT PLOTWINDOW .F10.4 (STREAMTOWORLDDY (fetch YCOORD
          of NEWCURSORPOS)
            PLOTVIEWPORT))
        (replace XCOORD of OLDCURSPOS with (fetch XCOORD of NEWCURSORPOS))
        (replace YCOORD of OLDCURSPOS with (fetch YCOORD of NEWCURSORPOS))

```

(LOGTICFN

```

[LAMBDA (MIN MAX)
  (* returns TICINFO for log scale)
  (* assumes log to base 10 -- later base could be determined by
  plot prop)
  (COND
    [(GREATERP (DIFFERENCE MAX MIN)
      1)
      (* spans more than 1 decade; use equispaced tics on logscale)
      (LET ((NEWMIN (PLOT.FLOOR MIN))
        (NEWMAX (PLOT.CEILING MAX))
        RANGE NUMINT INC EXCESS)
        (SETQ RANGE (IDIFFERENCE NEWMAX NEWMIN))
        [SETQ NUMINT (for NUMINT from 2 to 7 smallest
          (TIMES NUMINT (PLOT.CEILING (FQUOTIENT RANGE NUMINT))
        (SETQ INC (PLOT.CEILING (FQUOTIENT RANGE NUMINT)))
        (SETQ EXCESS (DIFFERENCE (TIMES NUMINT INC)
          RANGE))
          (* EXCESS is additional number of decades to include for pretty
        RANGE)
        (add NEWMIN (MINUS (IQUOTIENT EXCESS 2)))
        (add NEWMAX (DIFFERENCE EXCESS (IQUOTIENT EXCESS 2)))
        (create TICINFO
          TICMAX _ NEWMAX
          TICMIN _ NEWMIN
          TICINC _ (for I from NEWMIN to NEWMAX by INC collect (CONS I (EXPT 10.0 I)
          (* plot is in a single decade; use equispaced tics on exponential
        (T
        scale)
        (LET ((MINEXP (EXPT 10.0 MIN))
          (MAXEXP (EXPT 10.0 MAX))
          (UNITSIZE (PLOT.FLOOR MIN))
          TICINFO)
          (* UNITSIZE is the unit interval in this decade)
          (bind (RANGE _ (PLOT.LOG10 (DIFFERENCE MAXEXP MINEXP))) while (LESSP RANGE UNITSIZE)
            do (SETQ UNITSIZE (SUB1 UNITSIZE)))
          (SETQ TICINFO (DEFAULTTICFN MINEXP MAXEXP NIL NIL UNITSIZE))
          (* check for zero endpoint)
          (with TICINFO TICINFO
            [COND
              [(EQP 0 TICMIN)
                (LET* ((UNITSIZEEXP (EXPT 10.0 UNITSIZE))
                  (LOWERMULT (PLOT.FLOOR (FQUOTIENT MINEXP UNITSIZEEXP)))
                  (UPPERMULT (PLOT.CEILING (FQUOTIENT MAXEXP UNITSIZEEXP)))

```

```

      UPPERUNITSIZEEXP)
    (COND
      [(LEQ UPPERMULT 10)
        (* entire plot fits in single decade --
           put a tic at each unit)
        (SETQ TICMIN (TIMES UNITSIZEEXP LOWERMULT))
        (SETQ TICMAX (TIMES UNITSIZEEXP UPPERMULT))
        (SETQ TICINC UNITSIZEEXP)
        (SETQ NTICS (ADD1 (DIFFERENCE UPPERMULT LOWERMULT)))
        (SETQ TICINC (NCONC1 (for VALUE from TICMIN by TICINC as I from 1
                               to (SUB1 NTICS) collect (CONS (PLOT.LOG10 VALUE)
                                                                VALUE))
                              (CONS (PLOT.LOG10 TICMAX)
                                     TICMAX))
          (T
            (* plot crosses decade bound -- switch to larger units after decade bound to avoid possibility of large number of tic marks)

            (SETQ UPPERUNITSIZEEXP (TIMES 10 UNITSIZEEXP))
            (SETQ UPPERMULT (PLOT.CEILING (FQUOTIENT MAXEXP UPPERUNITSIZEEXP)))
            (SETQ TICMIN (TIMES UNITSIZEEXP LOWERMULT))
            (SETQ TICMAX (TIMES UPPERUNITSIZEEXP UPPERMULT))
            (* 10-LOWERMULT tics using small units, UPPERMULT tics
               using large units)
            (SETQ NTICS (PLUS 10 (DIFFERENCE UPPERMULT LOWERMULT)))
            (SETQ TICINC
              (NCONC1 (NCONC (for VALUE from TICMIN by UNITSIZEEXP as I from LOWERMULT
                               to 9 collect (CONS (PLOT.LOG10 VALUE)
                                                    VALUE))
                        (for VALUE from UPPERUNITSIZEEXP by UPPERUNITSIZEEXP
                           as I from 1 to (SUB1 UPPERMULT)
                           collect (CONS (PLOT.LOG10 VALUE)
                                         VALUE)))
                    (CONS (PLOT.LOG10 TICMAX)
                           TICMAX))
              (T
                (* no adjustment needed)
                (SETQ TICINC (NCONC1 (for VALUE from TICMIN by TICINC as I from 1
                                       to (SUB1 NTICS) collect (CONS (PLOT.LOG10 VALUE)
                                                                       VALUE))
                                      (CONS (PLOT.LOG10 TICMAX)
                                             TICMAX))
                  (SETQ TICMIN (PLOT.LOG10 TICMIN))
                  (SETQ TICMAX (PLOT.LOG10 TICMAX)))
                TICINFO])
            )

            (* * Depends on PLOT)

            (FILESLOAD PLOT)

            (DECLARE%: EVAL@COMPILE

            (PUTPROPS HISTO.GETFREQ MACRO (OPENLAMBDA (ITEM)
              (COND
                ((LISTP ITEM)
                 (CDR ITEM))
                (T 1))))

            (PUTPROPS HISTO.GETVALUE MACRO (OPENLAMBDA (ITEM)
              (COND
                ((LISTP ITEM)
                 (CAR ITEM))
                (T ITEM))))

            )

            (DECLARE%: DONTCOPY DONTVAL@LOAD DOEVAL@COMPILE

            (DECLARE%: DOEVAL@COMPILE DONTCOPY

            (LOCALVARS . T)
            )
            )

            (PUTPROPS PLOTEXAMPLES COPYRIGHT ("Xerox Corporation" 1986 1987))

```

FUNCTION INDEX

COMPUTEMULTIPLE	1	HISTO.INTTICFN	3	HISTPLOT	4	SCAT.WORLDCOORD	7
HISTO.CHANGEBINS	1	HISTO.MAKEBINS	3	LOGTICFN	7	SCATPLOT	5
HISTO.COPYFN	2	HISTO.RESET	3	MAKEBININTERVAL	5	SUMMARYWINDOW.REPAINTFN ..	5
HISTO.DRAW	2	HISTO.TICFN	3	SCAT.LOGSCALE	6		
HISTO.INTSCALEFN	3	HISTO.VALUES	4	SCAT.POINTCOORDS	6		

MACRO INDEX

HISTO.GETFREQ	8	HISTO.GETVALUE	8
---------------------	---	----------------------	---

RECORD INDEX

BININTERVAL	5
-------------------	---
