Research Report

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D & D examples

by

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D&D Examples

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Following the D&D rule described in Shibata, Sibuya and Takagiwa (1990), 24 examples in Cox and Snell (1981) are re-organized. An earth tide data collected by National Astronomical Observatory in Japan is also re-organized as an example of fairly large dataset with various attributes.

1. Cox and Snell (1981) Examples

	Possible.analysis	Primary.model	Design	Stype	Comments
A		point process		RADIX	irregularly observed
B		point process		SEQ	
C		contingency			Arrays
D	REG	functional relationship			
E		paired comparison			Array
F	REG				
G	REG				
H	LOGIS.LIN	paired dose response			0,1 response
I	ANOVA		BIB		
J	REG	accelerated test	CR		Array
K	ANOVA		RB(2^3 factorial)		Array
L	LOGIS.LIN		RB	SUM	
M	ANOVA		BIB	SUM	
N	ANOVA		RB		
O	ANOVA				Array

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P	ANOVA				
Q	ANOVA		NESTED		Array
R	ANOVA		SPLIT		Ragged array
S	ANOVA		RB	SEQ	
T		reliability			
U		proportional hazard			
V	LOG.LIN	contingency			Array
W	LOG.LIN	contingency			Array
X	LOGIS.LIN	contingency			Array

D&D file

```
# max_line_len 512
# max_str_len 1023
# max_name_len 500
# version  2.3

Cox.A=
(
 Title="Admission to intensive care unit"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Dr. A. Barr, Oxford Regional Hospital"
            assembler="M.Takagiwa, Keio Univ.")
 Research.field=("medical science" "hospital management")
 Keyword="Poisson process"
 Purpose=("Analysis of systematic variation in arrival time with respect
            to <day>, <week>, and <month>"
            "Efficient administration of care unit" )
 Source="A; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Primary.model="point process"
 Data.structure=(
            a.time=(Long.name="Arrival time of patient at intensive care unit"
                        Columns=("year" "day.of.week" "day" "month" "hour"
                                    "minute")
                        Stype=(RADIX=(year="year" month="month" day="day"
                                                hour="hour" minute="minute")
                                    )
                        )
            )
 Data=(
            year=(Long.name="Year")
            day.of.week=(Long.name="Day of week"
                        Dtype="interval class"
                        Code=("Su" "Mo" "Tu" "Wed" "Th" "Fr" "Sa")
                        )
            day=(Long.name="Day")
            month=(Long.name="Month"
                        Code=( "Jan" "Feb" "Mar" "Apr" "May" "Jun" "Jul"
                                    "Aug" "Sep" "Oct"  "Nov" "Dec")
```

```
                    )
          hour=(Long.name="24 hour clock")
          minute=(Long.name="Minute")
          )
Data.body=(
          year=( 207*1963 47*1964  )
          day.of.week=(2 2 6 2 7 2 2 4 4 5 2 2 5 6 1 5 5 7 6 7 1 4 6 1 1 1 5 5 7 3
                    3 7 3 3 4 5 2 3 3 1 2 7 2 3 7 2 3 3 5 7 1 2 4 5 5 6 7 3 5 7
                    7 2 4 2 2 4 5 5 1 3 3 6 6 7 2 2 3 3 4 5 7 1 3 3 2 3 4 6 7 7
                    7 7 1 3 4 7 7 2 5 6 7 7 4 4 4 1 3 3 3 2 4 7 7 2 5 7 1 3 3 4
                    6 1 2 4 7 2 3 3 6 7 3 4 5 5 1 3 7 1 7 1 1 1 3 4 7 4 5 6 6 2
                    2 3 4 5 6 7 7 2 3 6 6 6 7 1 2 3 5 7 7 1 3 4 6 7 7 1 2 3 3 3
                    3 5 5 7 7 1 2 4 5 6 7 7 1 2 3 6 6 7 1 2 2 3 3 4 4 7 3 5 6 1
                    2 3 3 3 6 6 7 1 3 3 4 6 1 2 3 5 7 4 5 6 4 4 5 6 3 3 4 2 3 3
                    3 4 5 1 2 3 4 2 4 6 3 4 4 4)
          day=(4 4 8 11 16 18 18 20 20 21 25 25 28 1 3 7 7 9 15 16 17 20 22 24 24
                    24 28 28 30 2 2 6 9 9 10 11 15 16 23 28 29 4 6 7 11 13 14 14 16
                    18 19 20 22 23 23 24 25 28 30 1 1 3 5 10 10 12 13 13 16 18 18 21
                    21 22 24 24 25 25 26 27 29 30 2 2 8 9 10 12 13 13 13 20 21 23 24
                    27 27 29 1 2 3 3 7 7 7 11 13 13 13 19 21 24 31 2 5 7 8 10 10 11
                    13 15 16 18 21 23 24 24 27 28 1 2 3 3 6 8 12 13 19 20 20 20 22
                    23 26 30 31 1 1 4 4 5 6 7 8 9 9 11 12 15 15 15 16 17 18 19 22 23
                    23 24 26 27 29 30 30 1 2 3 3 3 3 5 5 7 7 8 9 11 12 13 14 14 15
                    16 17 20 20 21 22 23 23 24 24 25 25 28 31 2 3 5 6 7 7 7 10 10 11
                    12 14 14 15 17 19 20 21 24 25 29 30 31 5 5 6 7 11 11 12 17 18 18
                    18 19 20 23 24 25 26 2 4 6 10 11 18 18)
          month=( 13*2 16*3 12*4 18*5 23*6 16*7 15*8 17*9 17*10 28*11 32*12
                    23*1 17*2 7*3 )
          hour=(11 17 23 10 12 8 16 10 15 20 4 12 2 12 5 7 12 16 16 1 11 16 19 17
                    20 21 12 12 18 22 22 22 12 19 18 16 16 20 23 20 18 16 22 8 19
                    15 12 18 14 13 23 19 22 10 12 18 21 21 0 1 12 14 22 12 13 17 11
                    17 23 10 13 11 18 11 4 7 20 21 6 17 20 22 20 21 17 19 2 1 3 4 23
                    3 19 21 21 0 2 15 21 8 14 17 3 15 17 14 2 11 17 17 21 3 13 23 20
                    23 20 16 18 21 21 17 13 15 14 19 14 22 9 17 12 17 14 16 14 14 15
                    4 11 11 15 15 11 2 11 21 3 0 10 9 23 10 7 13 12 13 19 0 7 15 18
                    19 23 1 10 7 15 18 23 19 19 16 10 2 22 21 19 11 15 16 18 10 20
                    13 16 2 20 14 21 18 14 14 1 1 18 14 15 16 10 13 17 19 22 7 17 12
                    23 10 13 2 12 15 17 17 1 20 12 15 3 18 13 16 18 20 11 16 13 21
                    7 22 16 23 19 11 0 14 15 12 17 18 21 16 12 2 12 20 10 15 17 20
                    2 1 1 2)
          minute=(0 0 15 0 0 45 0 0 30 20 0 0 20 0 30 30 0 0 0 30 5 0 0 45 20 0 0
                    0 0 0 0 5 45 30 45 15 0 30 40 20 45 30 0 45 15 30 0 15 0 0 0 15
                    0 15 30 15 5 0 30 45 20 45 30 30 15 30 20 30 0 55 30 0 30 5 0 30
                    0 30 30 30 45 0 15 0 30 50 0 45 40 15 55 15 0 45 30 45 30 30 0
                    45 30 0 30 45 30 0 0 30 30 10 20 0 30 0 10 15 0 0 30 0 10 0 25
                    5 10 15 5 40 30 30 30 30 30 0 0 10 0 30 30 50 55 20 40 15 15 15 30
                    0 40 0 45 45 0 50 30 30 45 30 15 45 20 40 50 55 45 50 50 30 0 5
                    30 0 10 0 30 0 50 10 45 45 30 30 5 0 35 45 15 30 0 15 45 5 15 15
                    45 0 15 15 15 20 35 15 50 45 25 0 30 15 30 45 30 0 45 0 0 30 15
                    30 40 30 35 30 40 0 0 15 40 55 0 45 30 40 10 15 0 15 40 45 45 0
                    0 45 0 0 30 55 20 30 50 30 0 0 45 45 5)
          )
)

Cox.B=
```

```
(
Title="Intervals between adjacent births"
Date=(created="1988-11-30" modified="1990-01-27")
Contributor=(investigator="Greenberg and White (1963)" assembler="M.Takagiwa, Keio Univ.")
Research.field=("demography"  "obsterics and gynecology")
Keyword="genealogy"
Purpose="Study of Natural variation of intervals between adjacent births due
        to (i) Systematic differences between the sex pairing MM, MF, FM and FF;
        (ii) Variation along with sequence number; and (iii) Pattern of
        interaction between (i) and (ii)."
Source="B; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
Explanation="The values of <MM>, <MF>, <FM> and <FF> are geometric means of
        intervals in month between two births classified."
Primary.model="point process"
Data.structure=(
        interval=(Long.name="Mean intervals"
                Columns=("f.size" "births" "MM" "MF" "FM" "FF")
                Stype=(SEQ=(which="births" given="f.size")
                        )
                )
        )
Data=(
        f.size=(Long.name="Number of children in the family"
                Dtype="sorted"
                Unit="1 person"
                        )
        births=(Long.name="Successive births in a particular series"
                Dtype="category"
                Code=("1-2" "2-3" "3-4" "4-5" "5-6")
                        )
        MM=(Long.name="Geometric mean of intervals between male
                and male babies"
                Unit="1 month"
                        )
        MF=(Long.name="Geometric mean of intervals between male
                and female babies"
                Unit="1 month"
                        )
        FM=(Long.name="Geometric mean of intervals between female
                and male babies"
                Unit="1 month"
                        )
        FF=(Long.name="Geometric mean of intervals between female
                and female babies"
                Unit="1 month"
                        )
        )
Data.body=(
        f.size=(2 2*3 3*4 4*5 5*6 )
        births=(1 1 2 1 2 3 1 2 3 4 1 2 3 4 5)
        MM=(39.8 31.0 42.8 28.4 34.2 43.1 25.3 30.3 33.7 41.6 24.2 27.6 29.8
                34.2 40.3)
        MF=(39.5 31.5 43.7 28.1 34.4 44.3 25.6 30.1 34.0 42.1 24.4 27.7 30.2
                34.2 41.0)
        FM=(39.4 31.4 43.3 27.5 34.3 43.3 25.6 29.9 33.7 41.9 24.0 27.5 30.3
```

```
                    34.1 40.6)
            FF=(39.3 31.1 43.4 27.8 35.0 42.8 25.5 30.0 34.7 41.3 24.5 27.6 30.8
                    33.4 39.9)
            )
)

Cox.C=
(
 Title="Statistical aspects of literary style"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Morton(1965)" assembler="M.Takagiwa, Keio Univ.")
 Research.field=("literary style" "Biblical")
 Purpose="Investigate the authorship of  10 Pauline works from the number
            of sentences having zero, one, two, ... occurrences of the word 'kai'"
 Source="C; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="Reference: Morton A.Q. (1965) The authorship of Greek
            prose (with discussion) J. R. Statist. Soc. A 128 169-233"
 Primary.model="contingency"
 Data.structure=(
            freq=(Long.name="Frequency of occurrences"
                    Axes=("works" "kai")
                    Value="sentences")
            total =( Long.name="Total number of kai's"
                    Axes="works"
                    Value="total.kai"
                    )
            )
Axis=(
            works=(Long.name="Pauline works"
                    Atype="category"
                    Levels=("Romans(1-15)" "1st Corinth." "2nd Corinth." "Galat."
                            "Philip." "Colos." "1st Thessal." "1st Timothy"
                            "2nd Timothy" "Hebrews")
                    )
            kai=(Long.name="Frequency of kai's in a sentence"
                    Atype="count"
                    Levels=("0" "1" "2" "3 or more")
                    )
            )
Data=(
            sentences=(Long.name="Number of sentences"
                    Dtype="count"
                    Unit="1 sentence"
                    )
            total.kai=(Long.name="Total number of kai's"
                    Dtype="count"
                    Unit="1 word"
                    )
            )
Data.body=(
            sentences=(
                    .Dim=(10 4)
                    .Data = (386 424 192 128 42 23 34 49 45 155 141 152
                    86 48 29 32 23 38 28 94 34 35 28 5 19 17 8 9 11 37
                    17 16 13 6 12 9 16 10 4 24)
```

```
                                        )
                total.kai=(282 281 185 82 107 99 99 91 68 253)
                                )
)

Cox.D=
(
 Title="Temperature distribution in a chemical reactor"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Cox and Snell (1981)"  assembler="M.Takagiwa, Keio Univ.")
 Research.field=("chemical engineering"  "plant design")
 Purpose="Difference of measured true temperatures at some sections
                of reactor from theoretical temperatures, which are the solution of
                a partial differential equation modelling the reactor"
 Source="D; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="Fictitious data based on a real investigation"
 Primary.model="functional relationship"
 Possible.analysis=( REG=( explanatory="t.temp" response="m.temp"))
 Data.structure=(
                temp=(Long.name="Measured temperature and Theoretical temperature
                 in 20 sections of reactor"
                                Columns=("m.temp" "t.temp")
                                )
                )
 Data=(
                m.temp=(Long.name="Measured temperature" Unit="1 degree")
                t.temp=(Long.name="Theoretical temperature" Unit="1 degree")
                )
 Data.body=(
                m.temp=(431 450 431 453 481 449 441 476 460 483 472 465 421 452 451
                                430 458 446 466 476)
                t.temp=(432 470 442 439 502 445 455 464 458 511 498 451 409 462 491
                                416 481 421 470 477)
                )
)

Cox.E=
(
 Title="A 'before and after' study of blood pressure"
 Date=(created="1988-11-30" modified="1990-01-27" )
 Contributor=(investigator="G.A.MacGregor; Charing Cross Hospital Medical School"
                assembler="M.Takagiwa, Keio Univ.")
 Research.field=("medical science" "pharmacology")
 Purpose=(
                "Assess the effect of treatment from before-and-after measurements."
                "For patients with moderate essential hypertension, supine
                systolic and diastolic blood pressures are measured immediately
                before and tow hours after taking 25mg of the drug captopril."
                )
 Explanation="For a report on the investigation and appreciable further
                summary data, see MacGregor, Markandu, Roulston and Jones(1979)"
 Source= "E; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Data.structure=(
                hyper=(Long.name="Hypertension"
                                Axes=("patient" "bef.aft" "sys.dias")
```

```
                    Value="pressure")
        )
Axis=(
        patient=(Long.name="Patient no." Atype="id" Levels=(1:15) )
        bef.aft=(Long.name="Before or after" Atype="ordered category"
                    Levels=("before" "after") )
        sys.dias=(Long.name="Systolic or diastolic" Atype="category"
                    Levels=("systolic" "diastolic") )
        )
Data=(
        pressure=( Long.name="Blood pressures before and after captopril"
                                Unit="1 mmHg")
                                )
Data.body=(
        pressure=(
                    .Dim=(15 2 2)
                    .Data=(210 169 187 160 167 176 185 206 173 146 174 201 198 148
                                154 201 165 166 157 147 145 168 180 147 136 151
                                168 179 129 131 130 122 124 104 112 101 121 124
                                115 102  98 119 106 107 100 125 121 121 106 101
                                85  98 105 103  98  90 98 110 103  82)
                    )
        )
)

Cox.F=
(
Title="Comparison of industrial processes in the presence of trend"
Date=(created="1988-11-30" Modified="1990-01-27" )
Contributor=(investigator="Cox and Snell(1981)" assembler="M.Takagiwa, Keio Univ.")
Research.field="quality control"
Keyword="plant-scale experiment"
Purpose=("The fitting of a small number of observations by a model containing
        nearly as many parameters as observations"
        "In a plant-scale experiment a batch of intermediate product
        was divided into 6 equal portions which were then processed on
        successive days by two different method.")
Source="F; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
Explanation="Fictitious data based on a real investigations"
Possible.analysis=( REG=( explanatory=("days" "process") response="yield") )
Data.structure=(
        experiment=(Long.name="Treatment and yields in plant-scale experiment"
                    Columns=("day" "process" "yield")
                    )
        )
Data=(
        day=(Long.name="Day" Unit="1 day")
        process=(Long.name="Method of process"
                    Dtype="category"
                    Code=("P1" "P2")
                    )
        yield=(Long.name="Yield")
        )
Data.body=(  days= (1 : 6)
        process=(1 2 2 1 1 2)
```

```
            yield=( 5.84 5.73 7.30 10.46 9.71 5.91 )
            )
)

Cox.G=
(
 Title="Cost of construction of nuclear power plants"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(
            investigator="W.E. Mooz, Rand Coop."
            assembler="M.Takagiwa, Keio Univ."
            )
 Research.field=("energy" "cost assessment")
 Purpose="Prediction of the capital cost in the construction of
            future LWR power plants"
 Source="G; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation=(
            "<permit.date> means data construction permit issued."
            "Mooz, W.E.(1978) Cost analysis of light water reactor power plants.
            Report R-2304-DOE. Rand Corp., Santa Monica Calif."
            )
 Possible.analysis=(
            REG=(
                        explanatory=("permit.date" "time1" "time2" "capacity"
                                    "prior" "north.east" "cooling.tower"
                                    "babcock.made" "experience" "turnkey" )
                        response="cost"
                        )
            )
 Data.structure=(
            plants=(Long.name="32 LWR power plants in USA"
                        Columns=("cost" "permit.date" "time1" "time2"
                                    "capacity" "prior" "north.east" "cooling.tower"
                                    "babcock.made" "experience" "turnkey" )
                        )
            )
 Data=(
            cost=(Long.name="Cost adjusted to 1976 base"
                        Unit="10e-6 dollar"
                        )
            permit.date=(Long.name="Date construction permit issued"
                        Unit="1 year"
                        )
            time1=( Long.name="Time between application for and issue of permit"
                        Dtype="interval class"
                        Unit="1 day"
                        )
            time2=( Long.name="Time between issue of operating license and
            construction permit"
                        Dtype="interval class"
                        Unit="1 day"
                        )
            capacity=( Long.name="Power plant net capacity"
                        Unit="1 MWe"
                        )
```

```
                prior=( Long.name="Prior existence of an LWR on same site"
                        Dtype="logical"
                        )
                north.east=( Long.name="Constructed in north east of USA"
                        Dtype="logical"
                        )
                cooling.tower=( Long.name="Use of cooling tower"
                        Dtype="logical"
                        )
                babcock.made=( Long.name="Nuclear steam supply system manufactured
                        by Babcock Wilcox"
                        Dtype="logical"
                        )
                experience=( Long.name="Cumulative number of power plants constructed
                        by each architect engineer who engaged in"
                        Dtype="count"
                        Unit="1 plant"
                        )
                turnkey=(Long.name="Partial turnkey plant"
                        Dtype="logical"
                        )
                )
 Data.body=(
                cost=(460.05 452.99 443.22 652.32 642.23 345.39 272.37 317.21 457.12
                        690.19 350.63 402.59 412.18 495.58 394.36 423.32 712.27 289.66
                        881.24 490.88 567.79 665.99 621.45 608.80 473.64 697.14 207.51
                        288.48 284.88 280.36 217.38 270.71)
                permit.date=(68.58 67.33 67.33 68.00 68.00 67.92 68.17 68.42 68.42
                        68.33 68.58 68.75 68.42 68.92 68.92 68.42 69.50 68.42 69.17
                        68.92 68.75 70.92 69.67 70.08 70.42 71.08 67.25 67.17 67.83
                        67.83 67.25 67.83)
                time1=(14 10 10 11 11 13 12 14 15 12 12 13 15 17 13 11 18 15 15 16 11
                        22 16 19 19 20 13  9 12 12 13 7)
                time2=(46 73 85 67 78 51 50 59 55 71 64 47 62 52 65 67 60 76 67 59 70
                        57 59 58 44 57 63 48 63 71 72 80)
                capacity=(687 1065 1065 1065 1065 514 822 457 822 792 560 790 530 1050
                        850 778 845 530 1090 1050 913 828 786 821 538 1130 745 821
                        886 886 745 886)
                prior=(1 1 0 1 0 1 1 1 0 1 1 1 1 1 1 1 1 0 1 0 1 0 1 0 1 1 1 1 1 0 0 0)
                north.east=(0 1 1 0 0 0 1 1 1 0 1 0 1 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1
                        1 1 1 )
                cooling.tower=(1 0 0 0 0 0 0 1 1 1 0 1 1 0 1 1 1 1 0 1 1 0 1 0 1 0 0 1 0
                        1 1 1 1)
                babcock.made=(1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 1
                        0 0 1 0)
                experience=(14 1 1 12 12 3 5 1 5 2 3 6 2 7 16 3 17 2 1 8 15 20 18 3 19
                        21 8 7 11 11 8 11)
                turnkey=( 26*1 6*0 )
                )
)

Cox.H=
(
 Title="Effect of process and purity index on fault occurrence"
 Date=(created="1988-11-30" modified="1990-01-27")
```

```
 Contributor=(
              investigator="D.R. Cox and E.J. Snell"
              assembler="M.Takagiwa, Keio Univ."
              )
 Research.field=("industrial process"  "quality control")
 Keyword=("matched pairs" "logistic linear model")
 Purpose=("Test effects of modification of the process"
              "Batches of raw material of different purity were selected,
              and each of batches was divided into two equal sections; one of the
              sections was processed by the standard method and the other by a
              modified process."
              )
 Source="H; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="Fictitious data based on a real investigation"
 Primary.model="dose response"
 Design=( RB=(factors=("process" "batches" "purity")
                              ftypes=( 1 3 4 )
                              response="fault"
                              )
              )
 Possible.analysis=( LOGIS.LIN=( explanatory=("purity" "process")
                              response ="fault"
                              )
              )
 Data.structure=( effect=(Long.name="Effect of process and purity"
                              Columns=("purity" "process" "fault")
                              )
              )
 Data=(
              purity=(Long.name="Purity index")
              process=(Long.name="Processes"
                              Dtype="category"
                              Code=("Standard" "Modified")
                              )
              fault=(Long.name="Fault"
                              Dtype="logical"
                              Code=("No Fault" "Fault")
                              )
              )
 Data.body=(
              purity=( 7.2 6.3 8.5 7.1 8.2 4.6 8.5 6.9 8.0 8.0 9.1 6.5 4.9 5.3 7.1
                              8.4 8.5 6.6 9.1 7.1 7.5 8.3
                              7.2 6.3 8.5 7.1 8.2 4.6 8.5 6.9 8.0 8.0 9.1 6.5 4.9 5.3 7.1
                              8.4 8.5 6.6 9.1 7.1 7.5 8.3)
              process=(22*1 22*2)
              fault=(0 1 1 0 1 1 0 1 0 1 0 0 1 1 0 1 0 1 0 1 0 0 0
                              0 0 1 0 0 0 1 0 0 0 1 1 0 1 0 1 0 0 0 1 0)
              )
)

Cox.I=
(
 Title="Growth of bones from chick embryos"
 Date=(created="1988-11-30" modified="1990-01-27" )
 Contributor=(investigator="Biggers and Heyner(1961)"
```

```
            assembler="M.Takagiwa, Keio Univ.")
 Research.field=("experimental zoology" "nutrition" "poultry")
 Purpose=("Effect of chemicals to growth of bones"
            "Bones from 7-day-old chick embryos were cultivated over
            a nutrient chemical medium."
            )
 Source="I; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation=" C in <media> denotes the complete
            medium with 30 ingredients, and the five other media were obtained
            by omitting a single amino acid, e.g., His- in <media> is a medium
            without L-histidine."
 Design=( BIB=( v=6 k=2 b=15 r=5
                        factors=("media" "embryo")
                        ftypes=( 2 3 )
                        response="weight")
            )
 Possible.analysis=(ANOVA= )
 Data.structure=( growth=( Long.name="Growth of bones"
                                    Columns=("weight" "media" "embryo")
                                    )
                        )
 Data=(
            weight=(Long.name="Dry weight of tibiotars from seven-day-old chick embryos"
                        Transform = ( LOG = ( base = 10  orig.unit="micro gram") )
                        )
            media=(Long.name="Six kinds of media"
                        Dtype="category"
                        Code=("C" "His-" "Arg-" "Thr-" "Val-" "Lys-")
                        )
            embryo=(Long.name="Embryo"
                        Dtype="category"
                        Code=("Bone1" "Bone2")
                        )
            )
 Data.body=(
            weight=(2.51 2.49 2.54 2.58 2.65 2.11 2.28 2.15 2.32 2.15 2.34 2.30 2.20
                        2.26 2.28 2.15 2.23 2.26 2.15 2.41 1.90 2.11 1.70 2.53 2.23 2.15
                        2.49 2.18 2.43 2.56)
            media=(1 1 1 1 1 2 2 2 2 3 3 3 4 4 5 2 3 4 5 6 3 4 5 6 4 5 6 5 6 6)
            embryo=(15*1 15*2)
            )
)

Cox.J=
(
 Title="The number of cycles to failure of the length of worsted yarn under
            cycles of repeated loading"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="A. Barella and A. Sust, Wool Textile Organization"
            assembler="M.Takagiwa, Keio Univ.")
 Research.field=("industry" "life test")
 Purpose="Life test of worsted yarn with the covariates regarding with
             the test"
 Source="J; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="3-way factorial experiment model on log(cycles);
```

```
            assembler="M.Takagiwa, Keio Univ.")
 Research.field=("experimental zoology" "nutrition" "poultry")
 Purpose=("Effect of chemicals to growth of bones"
            "Bones from 7-day-old chick embryos were cultivated over
            a nutrient chemical medium."
            )
 Source="I; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation=" C in <media> denotes the complete
            medium with 30 ingredients, and the five other media were obtained
            by omitting a single amino acid, e.g., His- in <media> is a medium
            without L-histidine."
 Design=( BIB=( v=6 k=2 b=15 r=5
                        factors=("media" "embryo")
                        ftypes=( 2 3 )
                        response="weight")
            )
 Possible.analysis=(ANOVA= )
 Data.structure=( growth=( Long.name="Growth of bones"
                                    Columns=("weight" "media" "embryo")
                                    )
                        )
 Data=(
            weight=(Long.name="Dry weight of tibiotars from seven-day-old chick embryos"
                        Transform = ( LOG = ( base = 10  orig.unit="micro gram") )
                        )
            media=(Long.name="Six kinds of media"
                        Dtype="category"
                        Code=("C" "His-" "Arg-" "Thr-" "Val-" "Lys-")
                        )
            embryo=(Long.name="Embryo"
                        Dtype="category"
                        Code=("Bone1" "Bone2")
                        )
            )
 Data.body=(
            weight=(2.51 2.49 2.54 2.58 2.65 2.11 2.28 2.15 2.32 2.15 2.34 2.30 2.20
                        2.26 2.28 2.15 2.23 2.26 2.15 2.41 1.90 2.11 1.70 2.53 2.23 2.15
                        2.49 2.18 2.43 2.56)
            media=(1 1 1 1 1 2 2 2 2 3 3 3 4 4 5 2 3 4 5 6 3 4 5 6 4 5 6 5 6 6)
            embryo=(15*1 15*2)
            )
)

Cox.J=
(
 Title="The number of cycles to failure of the length of worsted yarn under
            cycles of repeated loading"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="A. Barella and A. Sust, Wool Textile Organization"
            assembler="M.Takagiwa, Keio Univ.")
 Research.field=("industry" "life test")
 Purpose="Life test of worsted yarn with the covariates regarding with
             the test"
 Source="J; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="3-way factorial experiment model on log(cycles);
```

```
Cox.K=
(
 Title="Factorial experiment on diets for chickens"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator=("Duckworth"  "Carpenter" )
              assembler="M.Takagiwa, Keio Univ.")
 Research.field="biology"
 Keyword=("poultry" "diet" "3-way design")
 Purpose="An experiment comparing 3x2x2 methods of feeding chickens was
          done independently in two replicates arranged in different houses.
          Factors for the methods are form of protein, level of protein
          and level of fish solubles."
 Source=( "K; Cox and Snell (1981), Applied Statistics, Chapman and Hall"
          "John and Quenouille; Duckworth and Carpenter(1977)" )
 Design=(
          RB=(
                    factors=("form" "protein" "fish" "house")
                    ftypes=( 1 1 1 3 )
                    response="weight"
                    )
          )
 Possible.analysis=(ANOVA=)
 Data.structure=(total=(Long.name="Total weights of 16 six-week-old chicks"
                    Axes=("form" "protein" "fish" "house" )
                    Value="weight"
                    )
          )
Axis=(
          form=(Long.name="Form of protein"
                    Atype="category"
                    Levels=("Groundnut" "Soybean")
                    )
          protein=(Long.name="Level of protein"
                    Atype="category"
                    Levels=(0 1 2)
                    )
          fish=(Long.name="Level of fish solubles"
                    Atype="category"
                    Levels=(0 1)
                    )
          house=(Long.name="House"
                    Atype="category"
                    Levels=("I" "II")
                    )
          )
 Data=( weight=( Long.name="Weights" Unit="1 g")
          )
 Data.body=(
          weight=(
                    .Dim=(2 3 2 2)
                    .Data=( 6559 7094 6564 6943 6738 6748 7075 8005 7528 7359 7333
                              6764 6292 7053 6622 6249 6444 6422 6779 7657 6856
                              7292 6361 6560 )
                    )
          )
```

```
)

Cox.L=
(
 Title="Number of preferences for a brand of detergent"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Ries and Smith(1963)"
            assembler="M.Takagiwa, Keio Univ.")
 Research.field="marketing"
 Purpose="Individual expresses a preference between a new product of detergent and
            a standard one. Individuals are classified by water softness, temperature and
            previous experience. The purpose is the analysis of variance of these factors."

 Source="L; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Design=( RB=( factors=("softness" "temp" "previous")
                        ftypes=(1 1 2)
                        response=("freq" "n")
                        )
            )
 Possible.analysis=( LOGIS.LIN=(explanatory=("previous" "softness" "temp")
                        response=( yes="freq" total="n")
                        )
            )
 Data.structure=(
            preference=( Long.name="Number of preferences"
                                    Columns=("freq" "n" "softness" "temp" "previous")
                                    Stype=(SUM=(which="freq" total="n"))
                        )
            )
 Data=(
            freq=( Long.name="Frequency of answer 'yes prefer' "
                        Dtype="count"
                        Unit="1 person"
                        )
            n=( Long.name="Number of answers"
                        Dtype="count"
                        Unit="1 person"
                        )
            softness=(Long.name="Softness"
                        Dtype="ordered category"
                        Code=("Hard" "Medium" "Soft")
                        )
            temp=(Long.name="Temperature"
                        Dtype="ordered category"
                        Code=("Low" "High")
                        )
            previous=(Long.name="Previous use"
                        Dtype="logical"
                        )
            )
 Data.body=(
            freq=( 37 24 68 42 47 23 66 33 57 19 63 29 )
            n=( 89 67 110 72 102 70 116 56 106 48 116 56 )
            softness=( 1 1 1 1 2 2 2 2 3 3 3 3 )
            temp=( 1 2 1 2 1 2 1 2 1 2 1 2 )
```

```
            previous=( 1 1 0 0 1 1 0 0 1 1 0 0 )
            )
)

Cox.M=
(
 Title="Fertilizer experiment on growth of cauliflowers"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Mr.J.C. Gower, Rothamsted"
            assembler="M.Takagiwa, Keio Univ.")
 Research.field=("agriculture" "field test")
 Purpose="BIB experiments for the effect of nitrogen and potassium on the
            growth of cauliflowers."
 Source=("M;Cox and Snell(1981), Applied Statistics, Chapman and Hall"
            "Mr J.C. Gower, Rothamsted Experimental Station")
 Explanation=("For each fertilizer in each block 48 cauliflowers were grown,
            and the number of cauliflowers of 4 grades and unmarketable ones
            were counted. There are some missing values."
            "<grade> is the size measured by the number of cauliflowers
            fit into a standard crate.")
 Design=( BIB=(v=8 k=4 b=4 r=2
                        factors=("factor1" "factor2" "block" "grade")
                        ftypes=( 2 2 3 4 )
                        response="count"
                        )
            )
 Possible.analysis=(ANOVA=)
 Data.structure=(
            cauliflowers=( Long.name="Cauliflowers"
                        Columns=("count" "block" "factor1" "factor2" "grade")
                        Stype=(SUM=(which="count"
                                    given=("factor1" "factor2" "block")
                                    total=48)
                                    )
                        )
            )
 Data=(
            count=( Long.name="Frequency count"
                        Dtype="count"
                        )
            block=(Long.name="Block"
                        Dtype="id"
                        Range=(1:4)
                        )
            factor1=( Long.name="Nitrogen"
                        Dtype="ordered category"
                        Code=(0 60 120 180 )
                        Unit="unit/acre"
                        )
            factor2=( Long.name="Portassium"
                        Dtype="ordered category"
                        Code=(200 300 )
                        Unit="unit/acre"
                        )
            grade=( Long.name="Grade"
```

```
                    Dtype="ordered category"
                    Code=("12" "16" "24" "30" "unmarketable")
                    )
          )
 Data.body=(
          count=( 1 1 1 6 4 10 4 5 5 1 1 6 3 7 2 21 24 28 26 26 27 12 35 22
                    8 22 27 8 16 31 13 24 13 12 9 14 13 28 5 22 33 17 14 30 22
                    11 26 2 4 4 1 4 3 8 3 3 3 2 4 10 3 4 9 )
          block=( 6*1 3*2 4*3 2*4 4*1 4*2 4*3 4*4 4*1 4*2 4*3 4*4 4*1 4*2 4*3 4*4)
          factor1=( 3 4 1 3 2 4 4 2 3 2 1 4 3 3 4 1 3 2 4 4 2 1 3 2 1 4 3 1 3 4 2
                    1 3 2 4 4 2 1 3 2 1 4 3 1 3 4 2 1 3 2 4 4 2 1 3 2 1 4 3 1 3 4 2)
          factor2=( 2 1 1 2 2 1 2 1 1 2 1 1 2 1 2 1 2 2 1 2 1 2 1 2 1 1 2 2 1 2 1
                    1 2 2 1 2 1 2 1 2 1 1 2 2 1 2 1 1 2 2 1 2 1 2 1 2 1 1 2 2 1 2 1)
          grade=( 2*1 13*2 16*3 16*4 16*5 )
          )
)

Cox.N=
(
 Title="Subjective preference data on soap pads"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Johnson(1967)"
          assembler="M.Takagiwa, Keio Univ.")
 Research.field=("sample survey" "marketing")
 Purpose="Confounded factorial experiment. There were 32 judges and
          the experiment was done on two days. Each judge attached a score to
          two differently formulated pads on each of two days. The factors
          formulating pads were amount of detergent, coarseness of pad and
          solubility of detergent."
 Source=( "N; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
          "Analysis of a factorial experiment by Johnson,N.L.(1967)" )
 Design=(
          RB=(
                    factors=("detergent" "coarseness" "solubility" "day" "replicate" "judge")
                    ftypes=( 1 1 1 2 2 2 )
                    response="score"
                    )
          )
 Possible.analysis=(ANOVA=)
 Data.structure=(
          subject=(Long.name="Subjective scores"
                    Columns=("replicate" "judge" "detergent" "coarseness"
                              "solubility" "day" "score")
                    )
          )
 Data=(
          replicate=(Long.name="Replicate number"
                    Dtype="id"
                    )
          judge=(Long.name="Judgements"
                    Dtype="id"
                    )
          detergent=(Long.name="High detergent"
                    Dtype="logical"
                    )
```

```
        coarseness=(Long.name="High coarseness"
                    Dtype="logical"
                    )
        solubility=(Long.name="High solubility"
                    Dtype="logical"
                    )
        day=(Long.name="Day"
                    Dtype="sequence"
                    Code=("1st" "2nd")
                    )
        score=(Long.name="Five-point scale"
                    Dtype="score"
                    Code=("excellent" "very good" "good" "fair" "poor"))
                    )
Data.body=(
        replicate=( 32*1 32*2 32*3 32*4 )
        judge=(1 17 1 17 2 18 2 18 3 19 3 19 4 20 4 20 1 17 1 17 2 18 2 18
                    3 19 3 19 4 20 4 20 5 21 5 21 6 22 6 22 7 23 7 23 8 24 8 24
                    5 21 5 21 6 22 6 22 7 23 7 23 8 24 8 24 9 25 9 25 10 26 10 26
                    11 27 11 27 12 28 12 28 9 25 9 25 10 26 10 26 11 27 11 27 12
                    28 12 28 13 29 13 29 14 30 14 30 15 31 15 31 16 32 16 32 13
                    29 13 29 14 30 14 30 15 31 15 31 16 32 16 32)
        detergent= (0 0 1 1 1 1 0 0 0 0 1 1 0 0 1 1 0 0 1 1 1 1 0 0 0
                    0 1 1 0 0 1 1 0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1
                    0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 1 1 1 1 0
                    0 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1
                    0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 0 0 1 1 1
                    1 0 0 0 0 1 1 1 1 0 0)
        coarseness= (0 0 1 1 0 0 1 1 1 1 0 0 0 0 1 1 0 0 1 1 0 0 1 1 1
                    1 0 0 0 0 1 1 0 0 1 1 0 0 1 1 1 1 0 0 1 1 0 0
                    0 0 1 1 0 0 1 1 1 1 0 0 1 1 0 0 0 0 0 0 0 0 0
                    0 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 1 1 1 1 1 1
                    1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0
                    0 1 1 0 0 1 1 0 0 1 1)
        solubility= (0 0 1 1 0 0 1 1 0 0 1 1 1 1 0 0 0 0 1 1 0 0 1 1 0
                    0 1 1 1 1 0 0 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1
                    0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1
                    1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0
                    1 1 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 0 0 0 0
                    0 0 0 1 1 1 1 1 1 1 1)
        treatment=(1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 1 1 2 2 3 3 4 4 5 5 6 6 7 7
                    8 8 1 1 4 4 3 3 2 2 5 5 7 7 8 8 6 6 1 1 4 4 3 3 2 2 5 5 7 7
                    8 8 6 6 1 1 6 6 3 3 7 7 5 5 2 2 8 8 4 4 1 1 6 6 3 3 7 7 5 5
                    2 2 8 8 4 4 1 1 8 8 3 3 5 5 7 7 2 2 6 6 4 4 1 1 8 8 3 3 5 5
                    7 7 2 2 6 6 4 4)
        day=( 16*1 16*2 16*1 16*2 16*1 16*2 16*1 16*2 )
        score=(2 2 4 4 5 4 2 1 1 5 3 4 1 2 3 3 4 3 4 4 4 4 4 1 2 3 5 2 3 3
                    3 4 3 4 3 3 1 1 5 3 4 3 3 4 5 4 2 3 2 2 3 4 2 2 4 3 4 3 5
                    4 3 4 3 4 2 3 2 4 3 1 3 2 1 3 3 3 2 3 4 1 3 2 3 3 3 1 3 1
                    1 3 3 3 2 3 4 2 3 3 3 2 3 4 4 2 4 5 3 4 1 4 4 3 1 4 4 3 4
                    4 3 2 5 5 3 4 2 3 3 4 4)
        )
)

Cox.O=
```

```
(
 Title="Atomic weight of iodine"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator=("Baxter and Landstredt(1940)" "Brownlee(1965)")
          assembler="M.Takagiwa, Keio Univ.")
 Research.field="chemistry"
 Purpose="Accurate determination of atomic weight of iodine from the
          ratios of reacting weight of iodine and silver, using five batches
          of silver and two batches of iodine."
 Source= "O; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation=("References: Statistical Methods in Medical Research,
          Armitage,P.(1971), Section 8.7, and Statistical Methods,
          Snedecor,G.W. and Cochran,W.G.(1967), Section 6.7"
          "Silver batch C in <silver> is a repurification of batch B,
          which in turn is a repurification of batch A." )
 Primary.model="Analysis of unbalanced data"
 Possible.analysis=(
          ANOVA=(
                    explanatory=("silver" "iodine")
                    response="weight")
                    )
 Data.structure=(
          ratios=(Long.name="Ratios of reacting weight of iodine"
                              Columns=("weight" "silver" "iodine")
                    )
          )
 Data=(
          weight=(Long.name="Ratio of reacting weight of silver and iodine"
                    Transform=(
                              RATIO=(denominator=1)
                              LIN = ( location=1.176399  scale = 10E6 )
                              )
                    )
          silver=(Long.name="Silver batch"
                    Dtype="category"
                    Code=("A" "B" "C" "D" "E")
                    )
          iodine=(Long.name="Iodine batch"
                    Dtype="category"
                    Code=("I" "II")
                    )
          )
 Data.body=(weight=(23 26 42 42 30 21 38 50 51 56 0 41 19 24 14 62)
          silver=( 1 1 2 2 3 3 3 4 4 5 1 1 1 2 2 4)
          iodine=( 10*1 6*2 )
          )
)

Cox.P=
(
 Title="Multifactor experiment on a nutritive medium"
 Date=(created="1988-11-30" modified="1990-01-27")
 Contributor=(investigator="Fedorov, Maximov and Bogorov(1968)"
               assembler="M.Takagiwa, Keio Univ.")
 Research.field="biology"
```

```
Purpose="To analyze an unbalanced fatorial experiment on a nutritive medium
        for green sulphur. 10 components, each at two levels, were tested."
Keyword="chloribrium thiosulphatophilum"
Source="P; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
Explanation=("Each factor was at two levels with each level used 8 times"
        "<x10>; Central level (10 ml of solution of micro-element per 11 of
        medium) corresponded to 10 times the amount of micro-element
        in Larsen's medium."
        "<yield>;  standard error of 3.8.")
Possible.analysis=( ANOVA=( explanatory=("x1" "x2" "x3" "x4" "x5" "x6"
                                "x7" "x8" "x9" "x10")
                        response="yield"
                        )
        )
Data.structure=(
        nutritive.med=( Long.name="nutritive medium"
                        Columns=("x1" "x2" "x3" "x4" "x5" "x6" "x7"
                                "x8" "x9" "x10" "yield")
                        )
        )
Data=(
        x1=(Long.name="Factor of NH4Cl"
                        Dtype="specified values"
                        Code=(1500  500 )
                        Unit="1 mg/l"
                        )
        x2=(Long.name="Factor of KH2PO4"
                        Dtype="specified values"
                        Code=(450 50 )
                        Unit="1 mg/l"
                        )
        x3=(Long.name="Factor of MgCl2"
                        Dtype="specified values"
                        Code=(900 100)
                        Unit="1 mg/l"
                        )
        x4=(Long.name="Factor of NaCl"
                        Dtype="specified values"
                        Code=(1500 500)
                        Unit="1 mg/l"
                        )
        x5=(Long.name="Factor of CaCl2"
                        Dtype="specified values"
                        Code=(350 50)
                        Unit="1 mg/l"
                        )
        x6=(Long.name="Factor of Na2S.9H2O"
                        Dtype="specified values"
                        Code=(1500 500)
                        Unit="1 mg/l"
                        )
        x7=(Long.name="Factor of Na2S2O3"
                        Dtype="specified values"
                        Code=(5000 1000)
                        Unit="1 mg/l"
```

```
                    )
            x8=(Long.name="Factor of NaHCO3"
                    Dtype="specified values"
                    Code=(5000 1000)
                    Unit="1 mg/l"
                    )
            x9=(Long.name="Factor of FeCl3"
                    Dtype="specified values"
                    Code=(125 25)
                    Unit="1 mg/l"
                    )
            x10=(Long.name="Factor of micro-elements"
                    Dtype="specified values"
                    Code=(15 5)
                    )
            yield=(Long.name="Yield")
                    )
 Data.body=(
            x1=(2 2 1 2 1 1 2 1 2 1 2 1 1 2 1 2)
            x2=(1 2 2 2 2 2 2 1 1 1 1 1 1 1 2 2)
            x3=(1 1 2 1 1 1 2 2 2 1 1 1 2 2 2 2)
            x4=(1 1 1 2 1 2 2 1 1 1 2 2 2 2 2 1)
            x5=(2 2 1 1 1 1 2 1 2 1 1 2 1 2 2 2)
            x6=(1 1 1 1 1 1 2 2 2 2 2 2 2 1 2 1)
            x7=(2 1 2 2 1 1 2 2 1 2 1 1 1 2 2 1)
            x8=(1 2 2 1 2 1 2 1 2 2 1 1 2 2 1 1)
            x9=(2 2 2 1 2 1 2 1 2 1 1 2 1 1 1 2)
            x10=(1 1 2 1 2 1 2 2 1 2 1 2 2 2 1 1)
            yield=(14.0 4.0 7.0 24.5 14.5 71.0 15.5 18.0 17.0 13.5 52.0 48.0
                    24.0 12.0 13.5 63.0)
            )
)

Cox.Q=
(
 Title="Strength of cotton yarn"
 Date=(created="1988-11-30" modified="1990-01-28")
 Contributor=(assembler="M.Takagiwa, Keio Univ.")
 Purpose="Estimating (i) the difference in mean strength of two worsted
          yarns produced by slightly different process, and (ii) the variation
          of strength between and within bobbins for yarns of this type."
 Source="Q; Cox and Snell (1981), Applied Statistics, Chapman and Hall"
 Research.field="industry"
 Design=(
            NESTED=(
                    factors=("yarn" "bobbin" "samples")
                    ftypes=(1 5 6)
                    response="strength"
                    )
            )
Observation.mechanism=(
            SYS=(which="yarn")
            RND=(which="bobbin" given="yarn" size=6)
            RND=(which="samples" given=("yarn" "bobbin") size=4)
            )
```

```
Possible.analysis=(ANOVA= )
Data.structure=(
        loads=(Long.name="Breaking loads"
                Axes=("samples" "bobbin" "yarn")
                Value="strength"
                )
        )
Axis=(
        yarn=(Long.name="Yarn"
                Atype="category"
                Levels=("A" "B")
        )
        bobbin=(Long.name="6 bobbins selected at random"
                Atype="sequence"
                Levels=(1:6)
                )
        samples=( Long.name="Samples"
                Atype="id"
                Levels=(1:4)
                )
        )
Data=(
        strength=(Long.name="Strength" Unit="1 oz")
        )
Data.body=(
        strength=(.Dim=(4 6 2) .Data=(15.0 17.0 13.8 15.5 15.7
                15.6 17.6 17.1 14.8 15.8 18.2 16.0
                14.9 14.2 15.0 12.8 13.0 16.2 16.4 14.8 15.9 15.6 15.0 15.5
                18.2 16.8 18.1 17.0 17.2 18.5 15.0 16.2 15.2 15.9 14.5 14.2
                15.6 16.0 15.2 14.9 19.2 18.0 17.0 16.9 16.2 15.9 14.9 15.5)
                )
        )
)

Cox.R=
(
 Title="Biochemical experiment on the blood of mice"
 Date=(created="1988-11-30" modified="1990-01-28")
 Contributor=(assembler="M.Takagiwa, Keio Univ.")
 Research.field="biochemistry"
 Purpose="To see the effect of treatments A, < treatment.a>,
        and B, <treatment.b>, on the amount, <amount>, of substances S
        in mice's blood"
 Source="R; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="References: Snedecor and Cochran (1967, Section 12.12),
        Armitage (1971, Section 8.5), and Cox (1958, Section 17.4)"
 Design=(
        SPLIT=(
                factors=("day" "sex" "treatment.a" "treatment.b")
                ftypes=(3 2 1 1)
                response="amount"
                )
        )
 Observation.mechanism=( RND=(which="day" given="sex" size=4) )
 Possible.analysis=(ANOVA=)
```

```
Data.structure=(
        effect=(Long.name="Amount of substances S"
                Columns=("day" "sex" "treatment.a" "treatment.b" "amount") )
        )
Data=(
        day=(Long.name="Day of treatment"
                Dtype="sequence"
                Unit="1 day"
                )
        sex=(Long.name="Sex of mices"
                Dtype="logical"
                Code=("male" "female")
                )
        treatment.a=(Long.name="Treatment A"
                Dtype="logical"
                Code=("absent" "present")
                )
        treatment.b=(Long.name="Treatment B"
                Dtype="logical"
                Code=("absent" "present")
                )
        amount=(Long.name="Amount of substance S"
                )
        )
Data.body=( day=( 4*1 4*2 4*3 4*4 4*5 4*6 4*7 4*8 )
        sex=( 8*0 4*1 4*1 8*1 4*0 4*1 )
        treatment.a=(0 2 0 2 0 2 0 2 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 0 2 0 2 0 2 2 2 0)
        treatment.b=(1 1 0 0 0 0 1 1 1 1 0 0 0 1 0 1 1 0 0 1 0 1 1 0 1 1 0 0 0 1 0 1)
        amount=(4.4 6.8 4.4 1.8 5.3 3.3 1.9 8.7 7.1 4.3 5.3 7.0 1.8 4.8 1.6 3.1
                5.1 3.7 5.9 6.2 5.4 5.7 6.7 6.5 6.2 9.3 5.4 6.9 5.2 7.9 6.8 7.9)
        )
)

Cox.S=
(
Title="Voltage regulator performance"
Date=(created="1988-11-30" modified="1990-01-28")
Contributor=(investigator="Desmond (1954)"
        assembler="M.Takagiwa, Keio Univ.")
Research.field="quality control"
Purpose="To isolate that part of the observed variation that is 'real'
        variation between regulators, as contrasted with testing or
        measurement error."
Source="S; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
Explanation=( "Reference: Snedecor and Cochran(1967, Section 12.11)"
        "Normal procedure was for a regulator from the production line
        to be passed to one of a number of setting stations, where
        the regulator was adjusted on a test rig. These regulator then
        passed to one of four testing stations, where the regulator
        was tested  and if found to be unsatisfactory, it was passed
        down the production line to be rest." )
Design=(
        RB=(
                factors=("setting" "number" "testing")
                ftypes=( 2 2 2 )
```

```
                    response="voltage"
                    )
          )
Possible.analysis=(ANOVA=)
Data.structure=(regulator=(Long.name="Regulator voltages"
                              Columns=("setting" "number" "testing" "voltage")
                    )
          )
Data=(
          setting=(Long.name="setting station"
                    Dtype="category"
                    Code=("A" "B" "C" "D" "E" "F" "G" "H" "J" "K")
                    )
          number=(Long.name="Regulator number"
                    Dtype="id"
                    )
          testing=(Long.name="Testing station"
                    Dtype="id"
                    )
          voltage=(Long.name="Voltage"
                    Unit="1 V"
                    )
          )
Data.body=(
          setting=( 32*1 16*2 28*3 28*4 16*5 28*6 32*7 24*8 24*9 28*10 )
          number=( 1 2 3 4 5 6 7 11 1 2 3 4 5 6 7 11 1 2 3 4 5 6 7 11 1 2 3 4 5 6
                    7 11 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 5 6 10 1 2 3 4 5
                    6 10 1 2 3 4 5 6 10 1 2 3 4 5 6 10 1 2 3 4 5 6 11 1 2 3 4 5 6
                    11 1 2 3 4 5 6 11 1 2 3 4 5 6 11 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3
                    4 1 2 3 4 5 6 11 1 2 3 4 5 6 11 1 2 3 4 5 6 11 1 2 3 4 5 6 11
                    1 2 3 4 5 6 7 12 1 2 3 4 5 6 7 12 1 2 3 4 5 6 7 12 1 2 3 4 5 6
                    7 12 1 2 3 4 5 10 1 2 3 4 5 10 1 2 3 4 5 10 1 2 3 4 5 10 1 2 3
                    4 5 10 1 2 3 4 5 10 1 2 3 4 5 10 1 2 3 4 5 10 1 2 3 4 5 6 11
                    1 2 3 4 5 6 11 1 2 3 4 5 6 11 1 2 3 4 5 6 11 )
          testing=(8*1 8*2 8*3 8*4 4*1 4*2 4*3 4*4 7*1 7*2 7*3 7*4 7*1 7*2
                    7*3 7*4 4*1 4*2 4*3 4*4 7*1 7*2 7*3 7*4 8*1 8*2 8*3 8*4
                    6*1 6*2 6*3 6*4 6*1 6*2 6*3 6*4 7*1 7*2 7*3 7*4 )
          voltage=(16.5 15.8 16.2 16.3 16.2 16.9 16.0 16.0 16.5 16.7 16.5 16.5
                    16.1 17.0 16.2 16.0 16.6 16.2 15.8 16.3 16.3 17.0 16.0 16.1
                    16.6 16.3 16.1 16.6 16.5 17.0 16.0 16.0 16.0 15.4 16.1 15.9
                    16.1 16.4 16.4 16.1 16.0 16.8 16.3 16.0 16.1 16.7 16.3 16.0
                    16.0 15.8 15.7 16.2 16.0 16.1 16.1 16.0 16.0 16.2 16.4 16.1
                    16.1 16.0 15.9 16.3 15.3 16.4 16.0 16.1 16.1 16.3 16.0 15.8
                    16.6 15.9 16.1 16.0 16.1 16.0 15.7 15.6 16.0 15.7 16.1 16.0
                    15.9 15.8 16.4 16.2 15.7 16.1 16.0 16.2 15.7 16.1 16.1 15.7
                    16.1 16.1 16.0 15.7 16.2 16.1 15.7 16.0 15.9 16.1 16.0 16.3
                    16.0 16.3 16.2 16.5 16.0 16.0 16.0 16.4 16.5 16.0 16.1 16.4
                    16.1 16.5 16.2 15.8 16.2 16.0 16.0 16.0 16.1 17.0 16.1 16.1
                    16.2 16.0 16.0 16.5 16.4 16.2 16.4 16.2 16.1 16.2 16.7 16.7
                    16.2 16.2 16.1 16.0 15.5 16.0 16.0 15.8 15.9 15.9 16.0 16.1
                    15.5 15.6 16.4 16.5 16.1 16.1 16.4 16.2 15.3 15.7 16.2 16.2
                    15.9 15.8 16.0 16.2 15.6 16.2 16.2 16.2 16.0 15.7 16.0 16.1
                    15.5 15.8 16.2 16.1 16.1 16.1 15.6 16.2 15.4 16.2 16.2 16.1
                    15.4 16.0 16.1 16.0 16.3 16.0 15.8 16.2 16.3 16.1 16.2 16.1
                    16.2 16.2 16.4 16.2 16.1 16.4 16.1 15.3 16.7 16.5 16.4 16.3
```

```
                    15.8 17.8 16.5 16.1 16.1 16.4 16.0 16.3 16.5 16.1 16.3 16.4
                    15.9 15.8 16.2 16.2 16.0 16.0 16.0 16.0 15.7 16.2 16.3 16.0
                    16.4 16.1 15.8 16.7 16.2 15.9 16.0 16.2 16.0 16.1 16.0 16.3
                    16.3 16.0 16.2 16.1)
          )
)

Cox.T=
(
 Title="Intervals between the failure of air-conditioning equipment in aircraft"
 Date=(created="1988-11-30" modified="1990-01-28")
 Contributor=(investigator="Proschan(1963)" assembler="M.Takagiwa, Keio Univ.")
 Research.field=("mechanical engineering" "reliability")
 Keyword=("Gamma distribution" "failure time")
 Purpose=("homogeneity of failure time with respect to each aircraft"
          "sequential variation of reliability" )
 Source="T; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation="Cox, D.R. and Lewis,P.A.W.(1966). The Statistical Analysis of
          Series of Events. London: Chapman and Hall"
 Primary.model="reliability"
 Data.structure=(
          failure=(Long.name="Intervals between failures of air-conditioning"
                              Columns=("interval" "aircraft")
                              Stype=(SEQ=(which="interval" given="aircraft")
                              )
                    )
          )
 Data=(
          interval=(Long.name="Intervals between failures"
                    Unit="1 operating hour"
                    )
          aircraft=(Long.name="Aircraft number"
                    Dtype="id"
                    )
          )
 Data.body=(
          interval=( 413 14 58 37 100 65 9 169 447 184 36 201 118 34 31 18 18 67
                    57 62 7 22 34 90 10 60 186 61 49 14 24 56 20 79 84 44 59 29
                    118 25 156 310 76 26 44 23 62 130 208 70 101 208 74 57 48 29
                    502 12 70 21 29 386 59 27 153 26 326 55 320 56 104 220 239
                    47 246 176 182 22 15 104 35 23 261 87 7 120 14 62 47 225 71
                    246 21 42 20 5 12 120 11 3 14 71 11 14 11 16 90 1 16 52 95
                    97 51 11 4 141 18 142 68 77 80 1 16 106 206 82 54 31 216 46
                    111 39 63 18 191 18 163 24 50 44 102 72 22 39 3 15 197 188
                    79 88 46 5 5 36 22 139 210 97 30 23 13 14 359 9 12 270 603 3
                    104 2 438 487 18 100 7 98 5 85 91 43 230 3 130 102 209 14 57
                    54 32 67 59 134 152 27 14 230 66 61 34)
          aircraft=( 23*1 29*2 15*3 14*4 30*5 27*6 24*7 9*8 12*9 16*10 )
          )
)

Cox.U=
(
 Title="Survival times of leukemia patients"
 Date=(created="1988-11-30" modified="1990-01-28")
```

```
 Contributor=(investigator="Feigl and Zelen (1965)"
              assembler="M.Takagiwa, Keio Univ.")
 Research.field="medical science"
 Keyword="leukemia"
 Purpose=("The use of general considerations to choose between alternative
              parametric regressions relations."
              "The examination of the form of the random variation about such
              relation.")
 Source="U; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Primary.model="proportional hazard"
 Data.structure=(
              survival=(
                           Long.name="Survival time in weeks and log10 of initial
                           white blood cell count for 17 leukemia patients"
                           Columns=("cell" "time")
                           )
              )
 Data=(
              cell=(Long.name="Initial white blood cell count"
                           Dtype="count"
                           Transform = ( LOG = ( base=10,
                                        orig.unit="initial white blood cell count" )
                                        )
                           )
              time=(Long.name="Survival time of leukemia" Unit="1 week")
              )
 Data.body=(
              cell=(3.36 2.88 3.63 3.41 3.78 4.02 4.00 4.23 3.73 3.85 3.97 4.51 4.54
                           5.00 5.00 4.72 5.00)
              time=(65 156 100 134 16 108 121 4 39 143 56 26 22 1 1 5 65)
              )
)

Cox.V=
(
 Title="A retrospective study with binary data"
 Date=(created="1988-11-30" modified="1990-01-28")
 Contributor=(investigator="B. Woolf (1955)"
              assembler="M.Takagiwa, Keio Univ.")
 Research.field="Medical science"
 Keyword="peptic ulcers"
 Purpose="Restrospective investigation of the possible effect of blood
              group on the incidence of peptic ulcer."
 Source="V; Cox and Snell(1981), Applied Statistics, Chapman and Hall"
 Explanation=( "Reference: Woolf.B (1955); On estimating the relation
              between blood group and disease. Ann. Hum. Genetics, 19, 251-3"
              "Data are obtained in three cities for two blood group A and O.
              Blood group <blood.group> is recorded for peptic-ulcer subjects and for
              a control series of individuals not having peptic ulcer" )
 Primary.model="contingency"
 Possible.analysis=(
              LOG.LIN=(
                           explanatory=("city" "ulcer" "blood.group")
                           response="count"
                           )
```

```
        )
Data.structure=(
        blood=(Long.name="Blood groups for peptic ulcer and control subjects"
                Axes=("city" "ulcer" "blood")
                Value="count")
        )
Axis=(
        city=(Long.name="Name of city"
                Atype="category"
                Levels=("London" "Manchester" "Newcastle")
                )
        ulcer=(Long.name="Ulcer and control"
                Atype="category"
                Levels=("Peptic ulcer" "Control")
                )
        blood.group=(Long.name="Blood group"
                Atype="category"
                Levels=("Group O" "Group A")
                )
        )
Data=(
        count=(Long.name="Number of individuals"
                Dtype="count"
                Unit="1 person"
                )
        )
Data.body=(
        count=(
                .Dim=(3 2 2)
                .Data=(911 361 396 4578 4532 6598 579 246 219 4219 3775 5261)
                )
        )
)

Cox.W=
(
 Title="Housing and associate factors"
 Date=(created="1988-11-30" modified="1990-01-28")
 Contributor=(investigator="M. Madsen(1976)"  assembler="M.Takagiwa, Keio Univ.")
 Keyword="housing"
 Research.field=("urban planning" "building engineering")
 Purpose="Investigation into satisfaction with housing condition in Copenhagen.
        Residents were questioned on their satisfaction, the degree of contact with
        other residents and their feeling of influence on apartment management.
        The purposes of the investigation was to study association between these
        factors and the type of housing."
 Source="W; Cox and Snell(1981), Applied statistics, Chapman and Hall"
 Explanation="Reference: Madsen M. (1976); Statistical analysis of
        multiple contingency tables. Two examples. Scand. J. Statist., 397-106."
 Primary.model="contingency"
 Possible.analysis=( LOG.LIN=(explanatory=("influence" "satisfaction"
                                "housing" "contact" ) response="count")
        )
 Data.structure=(
        housing=(
```

```
                Long.name="1681 persons classified according to satisfaction,
        contact, influence, and type of housing."
                Axes=("influence" "satisfaction" "housing" "contact" )
                Value="count"
                )
        )
 Axis=(
        housing=(Long.name="Type of housing"
                Atype="category"
                Levels=("Tower blocks" "Apartments" "Atrium houses"
                "Terraced houses")
                )
        influence=(Long.name="Feeling of influence on apartment management"
                Atype="ordered category"
                Levels=("Low" "Medium" "High")
                )
        contact=(Long.name="Degree of contact with other residents"
                Atype="ordered category"
                Levels=("Low" "High")
                )
        satisfaction=(Long.name="Degree of satisfaction with housing"
                Atype="ordered category"
                Levels=("Low" "Medium" "High")
                )
        )
 Data=(
        count=(Long.name="Number of persons"
                Dtype="count"
                Unit="1 person" )
        )
 Data.body=(
        count=(
                .Dim=(3 3 4 2)
                .Data=(21 34 10 21 22 11 28 36 36 61 43 26 23 35 18 17 40 54
                        13 8 6 9 8 7 10 12 9 18 15 7 6 13 5 7 13 11
                        14 16 3 19 23 5 37 40 23 78 48 15 46 45 25 43 86 62
                        20 10 7 23 22 10 20 24 21 57 31 5 23 21 6 13 13 13 )
                )
        )
)

Cox.X=
(
 Title="Education plans of Wisconsin schoolboys"
 Date=(created="1988-11-30" modified="1990-01-28")
 Contributor=(investigator="Sewell and Shah (1968)"
        assembler="M.Takagiwa, Keio Univ.")
 Research.field="education"
 Keyword=("educational aspirations" "highschool")
 Purpose=("Wisconsin highschool senior boys and girls are investigated
        for relationship between socioeconomic status, intelligence,
        parental encourage"
        "L, LM, UM and H mean 'low', 'lower middle' 'upper middle' and
        'high', respectively"
        )
```

```
Source="X; Cox and Snell(1981), Applied Statistics, Chpman and Hall"
Explanation="Reference: Sewell, W.H. and Shah, V.P. (1968). Social class,
        parental encouragement and educational aspirations,
        Amer. J. Sociol., 73 559-72"
Primary.model="contingency"
Possible.analysis=(
        LOGIS.LIN=(
                explanatory=("iq" "parent" "s.stat")
                response="attend")
        )
Data.structure=(
        response=(
                Long.name="Socioeconomic status, intelligence, parental
        encouragement and college plans for Wisconsin schoolboys"
                Axes=("iq" "parent" "s.stat" "attend")
                Value="freq"
                )
        )
Axis=(
        iq=(Long.name="Intelligence"
                Atype="ordered category"
                Levels=("L" "LM" "UM" "H")
                )
        parent=(Long.name="Parental encouragement"
                Atype="ordered category"
                Levels=("L" "H")
                )
        s.stat=(Long.name="Socioeconomics status"
                Atype="ordered category"
                Levels=("L" "LM" "UM" "H")
        )
        attend=(Long.name="Plans for attending college"
                Atype="logical"
                Levels=("Yes" "No")
                )
        )
Data=(
        freq=(Long.name="Frequency of response"
                Dtype="count"
                Unit="1 person"
                )
        )
Data.body = (
        freq = (
                .Data = (349 207 126 49 64 72 54 43
                        232 201 115 79 84 95 92 59 166 120 92 42 91 110 100
                        73 48 47 41 17 57 90 65 54 4 9 12 10 13 33 38 49 2
                        7 12 17 27 64 93 119 8 6 17 6 47 74 148 198 4 5 9
                        8 39 123 224 414)
                .Dim = (4 2 4 2)
                )
        )
)
```

2. Earth tide data

D&D file

```
#external exnef="exnef.data"
Tide=
(
 Title="Earth tide at Esashi, Extensiometer NE (Free End)"
 Date=(created="1989-10-07")
 Contributor=(
              investigator=(
              "M.Ishiguro, The Institute of Statistical Mathematics"
              "National Astronomical Observatory"
                            )
              assembler="M.Takagiwa, Keio Univ."
              )
 Research.field="geophysics"
 Purpose="To study internal structure of the earth as a solid
              from the measurement of extensiometer reflecting earth tide"
 Explanation=( "Sensitivity of the instrument is corrected
              at each point of <s.point> from the level <s.prev> to the level <s.new>.
              One possible way of calibration is to re-scale <exnef> by the linearly
              interpolated sensitivity" "<gap.v> is the gap at <gap.point>,
              which is indicated by the re-scaled <exnef>."
              )
 Data.structure=(
              environ=(Long.name="Condition of measurement"
                            Axes="environ"
                            Value="environ.v"
                            )
              s.change=( Long.name="Sensitivity change of the extensiometer"
                            Columns=( "s.point" "s.prev" "s.new")
                            Stype=( INDEX=( which="s.point"  of="exnef"))
                            )
              gap=( Long.name="Gap after calibration"
                            Columns=("gap.point" "gap.v" )
                            Stype =( INDEX=( which="gap.point" of="exnef") )
                            )
              strain=(Long.name="Measurement for Earth tide survey"
                            Columns="exnef"
                            Stype=(
                                          TIME.SERIES=(
                                                        time=("year" "month" "day" "hour"
                                                                      "minute")
                                                        value="exnef"
                                                        )
                                          INVALID=(
                                                        which="exnef"
                                                        where=(1:168 1177:1190
                                                        1773:1778 1822:1828 2447:2467
                                                        3005:3020 3101:3114 4162:4169 5297:5305
                                                        5322:5328 5346:5354 6567:6573 8051:8060
                                                        8525:8538 8579:8781 10105:10106)
                                                        code="missing"
```

```
                                                    )
                                              )
                                        )
                    )
Axis=(
                    environ=( Long.name="Environment"
                              Levels=("latitude" "longitude" "altitude" "gravity" )
                              )
                    )
Data=(
                    year=(Long.name="Start and end year")
                    month=(Long.name="Start and end month"
                              Code=("Jan" "Feb" "Mar" "Apr" "May" "Jun" "Jul" "Aug" "Sep"
                                        "Oct" "Nov" "Dec")
                              )
                    day=(Long.name="Start and end day")
                    hour=(Long.name="Start and end hour")
                    minute=(Long.name="Start and end minute")
                    environ.v=( Long.name="Environment variable")
                    s.point=( Long.name="Sensitivity change point")
                    s.prev=( Long.name="Sensitivity of extensiometer before correction")
                    s.new=( Long.name="Sensitivity of extensiometer after correction")
                    gap.point=( Long.name="Gap point of rescaled values of extensiometer")
                    gap.v=( Long.name="Gap values")
                    exnef=(Long.name="Extensiometer"
                              Unit="1 STRAIN" )
                    )
Data.body=(
                    year=(1979 1979) month=(6 12) day=(1 31) hour=(0 23) minute=(0 30)
                    environ.v=(39.148 141.335 370.0 980.122)
                    s.point=(1 5004 9372 10272)
                    s.prev=(NA -0.9849 -0.9948 -0.9948)
                    s.new=(-0.9863 -0.9849 -0.9948 -0.2429)
                    gap.point=(292 1217 1359 1383 1477 2068 2226 3364 4189 4338 5000 5525
                              5830 6922 7216 7357 7830 8262 8270 8992 9329 12132 12211)
                    gap.v=( -30 -4.5  4  3.5  -1.5  36.5  1.8  -4  31  5  -18  17.5  39
                              -1.5  34.5 4  -35.5  1  -2  -4  -6.5  21  -1.4)
                    exnef=
                    )
)
```

References

Cox, D. R and Snell, E.J. (1981)
Applied Statistics: Principles and Applications,
Chapman and Hall, MA.

Shibata, R., Sibuya, M. and Takagiwa, M. (1990)
Data and Description Rule, Research Report of Dept. Math.,
Keio University, KSTS/RR-90/001.