

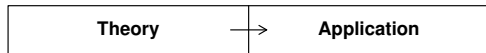
R Usage in Iceland

in Ancient and Modern Times

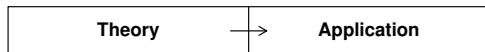
Árni Magnússon

arnima@hafro.is

MRI, 28 August 2014



1600 – 1970



1970 onwards



Overview

The Saga

Prehistory, settlement, people

Overview

The Saga

Prehistory, settlement, people

Icelandic

Character encoding, literate data analysis

Overview

The Saga

Prehistory, settlement, people

Icelandic

Character encoding, literate data analysis

Contributions

Core functions, CRAN packages

Overview

The Saga

Prehistory, settlement, people

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Contributions

Core functions, CRAN packages

Mystery Guest

?

Bell Labs



Bell Laboratories

Murray Hill, NJ

41°N 74°W

Bell Labs



1947 transistor

1969 Unix

1973 C

1976 S

1985 C++

1993 UTF-8

Bell Labs



1947 transistor

1969 Unix

1973 C

1976 S ←

1985 C++

1993 UTF-8

1977

John W. Tukey

EXPLORATORY DATA ANALYSIS

THE FUTURE OF DATA ANALYSIS¹

1962

By JOHN W. TUKEY

Princeton University and Bell Telephone Laboratories

I. General Considerations	2
1. Introduction	2
2. Special growth areas	3
3. How can new data analysis be initiated?	4
4. Sciences, mathematics, and the arts	5

The Technical Tools of Statistics

1965

JOHN W. TUKEY

Princeton University and Bell Telephone Laboratories

We are gathered here to look both forward and back. What have our technical tools been? What are they today? What can we see of what they are to become?

The assessment of the future is always chancy. Who knows this better than a statistician? Yet experience has

tions of statistics are many—as our recently departed colleague, Walter Wilcoxon, who was only 23 years younger than our association, pointed out nearly 30 years ago.

(1)

From the days when “statenkunde” meant the art of

1967

EPILOGUE
TOWARDS A SYSTEM

The w
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Announcement by the Working Party on Statistical Computing
GLIM (Generalized Linear Interactive Modelling Program)

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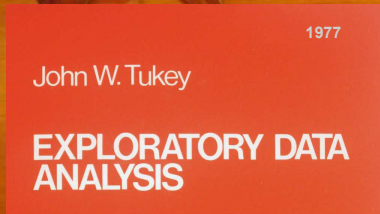
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18 | 2579

EPILOGUE

1967

TOWARDS A SYSTEM

The work to be done is doubtless great. If a general approach is required on a large scale, we must take. We must have one who is a user, or a

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Statistical Computing

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Some General Aspects of Statistical Computing

1967

JOHN M. CHAMBERS

Statistical Computing

1980

Statistical Computing: History and Trends

JOHN M. CHAMBERS

The original and it is a very interesting publication

1999

Statistical Computing and Graphics

Computing With Data: Concepts and Challenges

JOHN M. CHAMBERS

2000

Users, Programmers, and Statistical Software

John M. CHAMBERS

Statistical software provides essential support for statisticians and others who are analyzing data or doing research on new statistical techniques. Those supported typically regard themselves as "users" of the software, but as soon as they need to express their own ideas computationally, they in fact become "programmers." Nothing is more important for the success of statistical software than enabling this transition from user to programmer, and on to gradually more ambitious software design. What does the user need? How

S

S

- 1976 1 John Chambers (Bell Labs), GCOS machine
- 1980 2 Unix, NA, for, while, **brown book '84**
- 1988 3 S3 classes, formulas, **blue book '88**, white book '92
- 1998 4 S4 classes, connections, **green book '98**

S → S-Plus

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- 1988 3 S3 classes, formulas, **blue book '88**, white book '92
- 1998 4 S4 classes, connections, **green book '98**

S-Plus

- 1988 1 Douglas Martin (U Washington)
- ... Statistical Sciences merge with Mathsoft
- 1995 3.3 trellis
- 1996 3.4 nlme
- ...
- 2001 6 S4 classes, Mathsoft becomes Insightful
- ... R packages, Tibco buys Insightful

S → S-Plus → R

R

1993	beta	Ross Ihaka & Robert Gentleman (U Auckland), paper in J. Comput. Graph. Stat. '96
1997	0.5	core team, CRAN
2000	1.0	

S → S-Plus → R

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	1.4	S4 classes, mgcv
2002	1.5	lattice, Sweave
	1.6	namespace

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2009	2.9	Matrix
2010	2.12	reference classes
2011	2.14	parallel computations, byte compilation

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User Interface

Emacs (ESS 1989), Tinn-R (2005), RStudio (2011), etc.

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CRAN

- 1997 www.r-project.org (Vienna)
- 2000 cran.r-project.org, 10 mirrors on four continents

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Packages

- 1999 boot, coda, MASS, lme4, nlme, rpart, tseries
- 2000 ellipse, Matrix, mgcv, xtable
- 2001 car, DBI, gdata, gplots, gtools, lattice, scatterplot3d

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- 2003 lme4, maps
- 2004 rgl
- 2005 gmt, plotMCMC, reshape2, sp

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- 2003 lme4, maps
- 2004 rgl
- 2005 gmt, plotMCMC, reshape2, sp
- 2006 data.table, ggplot2
- 2008 plyr, Rcpp, roxygen2
- 2009 stringr
- 2012 knitr
- 2014 dplyr, r2d2

A morgun kl. 15



Næturfrost



S-Plus and R in Iceland

Hafró (Marine Research Institute)

- 1989 S-Plus used in research [GS](#), [GÖ](#)
- 1992 S-Plus beta tests in cooperation w/Statistical Sciences [GS](#), [GÖ](#)
geo collection of functions to draw maps, course [HB](#)
- 2002 **geo** S-Plus library [HB](#)
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standardized setup of libraries (core/site/user) **GÖ, ÁM**
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- 2011 S-Plus license expires

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- 2013 R source repository with version control **GÖ, ÁM**
package repository for in-house deployment **GÖ, HB, SPJ**
literate data analysis in stock assessment **EH**
- 2014 **hafroDB** (basic tools for database) **ÁM, SPJ**
paper in Tölvumál on literate programming **ÁM, SPJ**

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- 1992 S-Plus used in teaching **EÁ**
- 1997 R used in research **HT**
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- 2014 Icelandic R User Group **AHJ, BPE, SHL**

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- 2006 **stinepack** on CRAN **TJ, HB**
- 2007 7 in-house packages: **HB, TJ**
 - automatic computations on data streams
 - automatic updates of tables and plots

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... and many more institutes

Some Pioneers

First Users and Mentors

Gunnar Stefánsson	Hafró → HÍ (statistics)
Einar Árnason	HÍ (biometry)
Helgi Tómasson	HÍ (econometry)

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Others

Gunnar Örvarsson, Höskuldur Björnsson	Hafró
Árni Magnússon	UW → Hafró
Tómas Jóhannesson, Halldór Björnsson	Veðurstofan
Gunnlaugur Þór Briem	DataMarket
Sigurður Þ Jónsson, Einar Hjörleifsson	Hafró
Anna H Jónsdóttir, Bjarki Þ Elvarsson, Sigrún H Lund	HÍ (statistics)

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Teaching and Learning

- Extremely valuable if new students know some programming

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- How did kids learn programming 20–30 years ago?

Teaching and Learning

- Extremely valuable if new students know some programming
- Takes many years to become proficient
- How did kids learn programming 20–30 years ago?
- What about today?



```
def say_hello(name):  
    print("Hello, " + name + "!")  
    return name  
  
name = "Alice"  
say_hello(name)  
  
name = "Bob"  
say_hello(name)  
  
name = "Charlie"  
say_hello(name)  
  
name = "David"  
say_hello(name)  
  
name = "Eve"  
say_hello(name)  
  
name = "Frank"  
say_hello(name)  
  
name = "Grace"  
say_hello(name)  
  
name = "Heidi"  
say_hello(name)  
  
name = "Ivy"  
say_hello(name)  
  
name = "Jack"  
say_hello(name)  
  
name = "Karen"  
say_hello(name)  
  
name = "Leo"  
say_hello(name)  
  
name = "Mia"  
say_hello(name)  
  
name = "Noah"  
say_hello(name)  
  
name = "Olivia"  
say_hello(name)  
  
name = "Peter"  
say_hello(name)  
  
name = "Quinn"  
say_hello(name)  
  
name = "Rachel"  
say_hello(name)  
  
name = "Samuel"  
say_hello(name)  
  
name = "Tina"  
say_hello(name)  
  
name = "Uma"  
say_hello(name)  
  
name = "Victor"  
say_hello(name)  
  
name = "Wendy"  
say_hello(name)  
  
name = "Xavier"  
say_hello(name)  
  
name = "Yara"  
say_hello(name)  
  
name = "Zoe"  
say_hello(name)
```

Whiteboard with handwritten notes and diagrams.





1983
Basic



1983
Basic

1993
Pascal



1983
Basic

1993
Pascal

1995
S



1983
Basic

1993
Pascal

1995
S

1997
Java



1983
Basic

1993
Pascal

1995
S

1997
Java

2001
C++



1983
Basic

1993
Pascal

1995
S

1997
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2001
C++

2003
Lisp



1983
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Travels of Árni Magnússon

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2002	1.4	switch to R
2003	1.7	Args, env, is.what, keep, ll, rich.colors (gdata, gplots)
	1.8	cumuplot (coda)
2004	1.9	bxp (graphics)

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2005	2.1	gmt, plotMCMC, scape
2010	2.10	ora , aggregate.formula (stats)
	2.11	hafroAssmt
2014	3.0	r2d2
	3.1	hafroDB , ASCIIify (gtools)

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2014	3.0	r2d2
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Character Encoding

Example: þ

Encoding	Bits per char	Charset	Code	Byte
ASCII (1963)	7	127		
Latin-1 (1985)	8	255	fe	fe
UTF-8 (1993)	8/16/32	> 100 000	00fe	c3 b3

Tools

Encoding `get`

```
x <- "þorramatur"
```

```
Encoding(x)      # latin1 or UTF-8
```

Tools

Encoding get

```
x <- "þorramatur"  
Encoding(x)    # latin1 or UTF-8
```

iconv, enc2utf8 set

```
y <- iconv(x, to="UTF-8")  
z <- enc2utf8(x)
```

Tools

Encoding get

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x <- "þorramatur"  
Encoding(x)    # latin1 or UTF-8
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iconv, enc2utf8 set

```
y <- iconv(x, to="UTF-8")  
z <- enc2utf8(x)
```

ASCIIify gtools

```
y <- ASCIIify(x, bytes=1)    =>  \xfeorramatur  
z <- ASCIIify(x, bytes=2)    =>  \u00feorramatur
```


Configuration

Bash

```
export LANG=is_IS.UTF-8
```

Emacs

```
(setq-default buffer-file-coding-system 'utf-8)  
(prefer-coding-system 'utf-8)
```

R

```
getOption("encoding") # native.enc  
read.table("x.dat", fileEncoding="latin1")  
write.table(x, "x.dat", fileEncoding="UTF-8")
```

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```

Sweave

```
R CMD Sweave --encoding=UTF-8 x.Rnw  
Sweave("x.Rnw", encoding="UTF-8")
```

L^AT_EX

```
\usepackage[utf8]{inputenc}
```

Configuration

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Sweave ?

```
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```

L^AT_EX

```
\usepackage[utf8]{inputenc}
```

Literate Data Analysis

```
\documentclass[a4paper,twocolumn,12pt]{article}
\usepackage[icelandic]{babel}
\usepackage[nose,nogin]{Sweave}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\begin{document}

<<echo=FALSE>>
ar <- 2014
sIod <- paste0("http://data.hafro.is/asset/", ar, "/saithe/summary.csv")
ufsi <- read.csv(sIod)
ufsi <- ufsi[!is.na(ufsi$SSB),]
nuna <- ufsi$SSB[ufsi$Year==ar]
medaltal <- round(mean(ufsi$SSB))
#

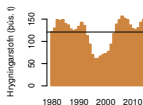
Hrygningarstofn ufsa í ársbyrjun \Sexpr{ar} er metinn \Sexpr{nuna} þúsund
tonn, en langtímaleðaltal frá 1980 er \Sexpr{medaltal} þúsund tonn (sjá mynd).

<<echo=FALSE, fig=TRUE, height=3.2, width=3.2>>
barplot(ufsi$SSB, names=ufsi$Year, col="peru", border="peru", space=0,
        ylab="Hrygningarstofn (þús. t)")
abline(h=medaltal)
#

\end{document}
```

Sweave

Hrygningarstofn ufsa í ársbyrjun 2014 er metinn 150 þúsund tonn, en langtímaleðaltal frá 1980 er 121 þúsund tonn (sjá mynd).



Literate Data Analysis

```
\documentclass[a4paper,twocolumn,12pt]{article}
\usepackage[icelandic]{babel}
\usepackage[nose,nogin]{Sweave}
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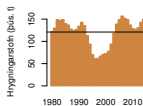
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abline(h=medaltal)
#

\end{document}
```

Sweave

Hrygningarstofn ufsa í ársbyrjun 2014 er metinn 150 þúsund tonn, en langtímaleðaltal frá 1980 er 121 þúsund tonn (sjá mynd).



Tools: Sweave, knitr

Paper: Tölvumál (autumn 2014, in press)

Literate Data Analysis

```
\documentclass[a4paper,twocolumn,12pt]{article}
\usepackage[icelandic]{babel}
\usepackage[noae,nogin]{Sweave}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\begin{document}
```

```
<<echo=FALSE>>=
```

```
ar <- 2014
slod <- paste0("http://data.hafro.is/assmt/", ar, "/sai/the/summary.csv")
ufsi <- read.csv(slod)
ufsi <- ufsi[!is.na(ufsi$SSB),]
nuna <- ufsi$SSB[ufsi$Year==ar]
medaltal <- round(mean(ufsi$SSB))
```

```
@
```

Hrygningarstofn ufsa í ársbyrjun $\text{\Sexpr{ar}}$ er metinn $\text{\Sexpr{nuna}}$ þúsund tonn, en langtímaeðaltal frá 1980 er $\text{\Sexpr{medaltal}}$ þúsund tonn (sjá mynd).

```
<<echo=FALSE, fig=TRUE, height=3.2, width=3.2>>=
```

```
barplot(ufsi$SSB, names=ufsi$Year, col="peru", border="peru", space=0,
        ylab="Hrygningarstofn (þús. t)")
abline(h=medaltal)
```

```
@
```

```
\end{document}
```

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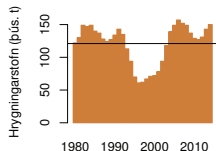
<<echo=FALSE>>=
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slod <- paste0("http://data.hafro.is/assmt/", ar, "/sai/the/summary.csv")
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Icelandic Contributions to Core R Functions

boxplot graphical parameters 2004

help(bxp)

widths	boxwex, staplewex, outwex
box	boxlty, boxlwd, boxcol, boxfill
median	medlty, medlwd, medpch, medcex, medcol, medbg
whiskers	whisklty, whisklwd, whiskcol
quartiles	staplelty, staplelwd, staplecol
outliers	outlty, outlwd, outpch, outcex, outcol, outbg

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aggregate formula interface 2010

`help(aggregate.formula)`

```
aggregate(weight ~ feed, chickwts, mean)
aggregate(breaks ~ wool+tension, warpbreaks, median)
aggregate(cbind(Ozone,Temp) ~ Month, airquality, max)
aggregate(. ~ Species, iris, mean)
aggregate(len ~ ., ToothGrowth, mean)
ag <- aggregate(len ~ ., ToothGrowth, mean)
xtabs(len ~ ., ag)
```

Icelandic Contributions to Core R Functions

boxplot graphical parameters 2004 — with Martin Mächler

`help(bxp)`

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aggregate formula interface 2010 — with Kurt Hornik

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Icelandic Packages on CRAN

2005	gmt	draw maps	ÁM
	plotMCMC	plot MCMC chains	ÁM, IS
	scape	stock assessment	ÁM
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2006	stinepack	interpolation	TJ, HB
2010	ora	Oracle interface	ÁM
	rdatamarket	DataMarket interface	GPB
2011	ctarma	time series analysis	HT
2014	r2d2	bivariate conf regions	ÁM, JB

The Saga

Prehistory, settlement, people

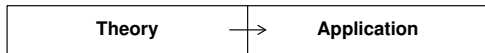
Icelandic

Character encoding, literate data analysis

Contributions

Core functions, CRAN packages

1600 – 1970



1970 onwards



The Saga

Prehistory, settlement, people

Icelandic

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Mystery Guest

?

Mystery Guest



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