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The Journey of an APL2 Bigot to Dyalog World

..or: How I Learned to Stop Worrying and Love ⎕ML

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Disclaimer

- All the dates, version numbers and features are based on how **I** happen to remember them!

- **I** use the following rating from my personal point of view:
    - ☝   a useful feature
    - 👌   a nice feature, good to have in the language
    - 👎   a more or less annoying feature

- And, of course: `⎕ML←3`

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Douglas Adams
(author, "*Hitchhiker's Guide to the Galaxy*")

"I've come up with a set of rules that describe our reactions to technologies:

1. Anything that is **in the world when you're born** is normal and ordinary and is just a natural part of the way the world works.

2. Anything that's **invented between you're fifteen and thirty-five** is new and exciting and revolutionary and you can probably get a career in it.

3. **Anything invented after you're thirty-five** is against the natural order of things."

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My APL CV

- 1981: APL\3000 (LUT)

- 1985: VSAPL, APLVSPC (IBM)
- 1986: **APL2** (State Computing Centre, **PSP Bank**)
- 1988: APL∗PLUS/PC (TVO Nuclear plant)
- 1990: **APL2/PC**
- 1992: APLI386
- 1993: ISIAPL/W, J
- 1994: APL2/OS2, APL∗PLUS II
- 1995: DyalogAPL 6.3, APL∗PLUS III (PSP)

- 1996: **DyalogAPL 7.1** (AJ Consulting, **Statistics Finland**)

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Why APL?

- Simple

- Consistent

- Intuitive

- Fun

"Everybody knows APL, they just don't know it yet"

— Dr. Alexander *Skoromokhov* (Sasha)

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APL2

- Logical and natural extension to VSAPL
  - *APL2 Programming: Language Reference*

- Program control: nothing new 👎👎

```
→(VEC=RC)/L1 L2 L3 L0
→L9⌈ι0∈ρDT
⍚(0=⎕NC'DATA')/'DATA←0 0ρ0'
```

- Mainframe environment

  - 16MB workspaces!

  - Full screen applications (APE)

  - Auxiliary processors with shared variables

    - User commands: 101

    - GDDM: 126

    - SQL/DB2: **127** 👍👍

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```
[0]        ∇ ESRPRINT_F X;A;I;N;LIST;PAGE
[1]        ⍝ Print the file ESR.FLIST
[2]        ⍝ W: page length, default 256
[3]
[4]         ⍎(0=⎕NC'W')/'W←256'
[5]         ⍎(~DONE)/'A←1 RAP_HOST''DELETE ESR.FLIST'''
[6]         N←↑⍴X←63 PAGELENGTH W↑[2]X
[7]         LIST←LEV 63 0 0 0 0 0 0
[8]         PAGE←'''',(∈USER),'.ESR.FLIST'''
[9]         OPENLIST(DONE+1)⊃'SHR' 'MOD'
[10]       L0:I←0
[11]        A←⎕SVR'TSOC'
[12]        DATLI←'TS (TN W'
[13]        CTLLI←'TS (CTL'
[14]        →L1⌈⍳2∧.=A←111 ⎕SVO¨'DATLI' 'CTLLI'
[15]        →0 MSG'AP111 PRINT ERROR. RETURN CODE:',⍕A
[16]       L1:→L2⌈⍳0∧.=A←DATLI,CTLLI
[17]       L2:→L3⌈⍳N<I←I+1
[18]        DATLI←(⎕AV[193 140],'¯-')CHANGE X[I;]
[19]        →L2⌈⍳0=A←CTLLI
[20]        →L3 MSG'WRITING ERROR ',(⍕A),' IN LINE: ',⍕I
[21]       L3:CLOSE_TS
[22]        DONE←1
```

APL2 Specific

- Editor

  ```
  ∇FUN[⎕]∇
  [1.2],[⍙],[/from/to],… 👎👎
  ```

- Miscellaneous

  - *Format by Example*: `'60:00'⍕⎕TS[4 5]` 👌
  - Functions are always ambivalent 👍
  - Identity functions and prototypes
  - Error trapping: `⎕EA, ⎕EC, ⎕ES`
  - Trace and stop vectors: `T∆FUN, S∆FUN` 👎
  - Transfer files: `)OUT, )IN, ⎕TF` 👍
  - Superscript minus allowed in names (`LBL¯01`)
  - Diamond wasn't available 👎

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Not So Intuitive APL2 Features

- *Partition*

  ```
  1 2 3 1 2 3 ⊂ 'ABCDEF'
  ```

  - I thought the result would be   `'AD' 'BE' 'CF'`
  - ..**but** it turned out to be   `'A' 'B' 'CD' 'E' 'F'`

- *Replicate*

  ```
  1 ¯2 3 0 1/'ABCD'  ↔  'A  BBBD'  ?
  ```

- Dyadic operator binding 👎

  ```
  + DOP A B C ↔ (+ DOP A)B C
  ```

- Jim *Brown* (Berlin 2000): "*What's Wrong with APL2*"

- But still: robust and reliable!

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First Contact with DyalogAPL 6.3 (1995)

- GUI interface programming 👍👍👍

```
'WINDOW' ⎕WC 'FORM'
'WINDOW' ⎕WS 'BCOL' 128 128 128
```

- Excel connection (DDE with shared variables) 👌👌

- Tracer 👍👍👍

- Editor 👍👍
  - Non-common clipboard shortcuts 👎
  - Constants are reformatted 👎

- No native file tools 👎

Culture Shock

- Some old favourite functions behaved oddly 👎👎

  ↑, ⊃, ⊂, ∈, ≡

- New operators and functions, enhanced syntax 👌

  ∘, ⍨, ∪, ∩, ⍪, ≠

  ⍳, ↓, +, ⊖, ⋄, [], `plus←+`, `counter+←1`

- Braces in function header
  - Shy result   `{z}←fun x` 👍
  - Ambivalent left argument   `{y} fun x` 👎

- New system functions

  ⎕FMT 👍, ⎕MONITOR 👍, ⎕NA 👍👍, ⎕SM, ⎕TRAP 👍, ⎕VFI 👍👍, ⎕XT, …

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Deviations: Vector Binding

- APL2:   ↔   DyalogAPL:

  ```
  1 2 'ABC'[2]                          1 2('ABC'[2])
  A B C←1 2                             A B(C←1 2)
  (A B C)←1 2 3                         (A B C)←1 2 3
                                          A B C ←1 2 3
  ```

- DyalogAPL:

  ```
  1 2 'abc'[2]        ↔  2
  a b c←1 2           ↔  LENGTH ERROR
  foo x←1 2 3         ↔  either foo(x←1 2 3)
                            or  LENGTH ERROR
  ```

  ➔ vector assignment without parentheses
     is considered **really** harmful 👎👎👎

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Deviations: Slash Symbol

- APL2: **always** an operator

```
//(1 2 3)'ABC'          ←→  SYNTAX ERROR

⎕FX ⊃'Z←X F Y' 'Z←X/Y'
 F/(1 2 3)'ABC'         ←→  ⊂'ABBCCC'
↑F/(1 2 3)'ABC'         ←→   'ABBCCC'
```

- DyalogAPL: **either** a function **or** an operator ☞

```
 // (1 2 3)'abcd'       ←→  ⊂'abbccc'
↑ // (1 2 3)'abcd'      ←→  LENGTH ERROR
↑(//)(1 2 3)'abcd'      ←→   'abbccc'
```

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DyalogAPL 7.1 - 8.0 (1996)

- `⎕ML` 👍👍👍

- `⎕N`-functions for native file handling 👍👍👍

- Namespaces 👍👍
  - The session namespace: `⎕SE` 👍
  - Workspace Explorer

- Control structures 👍👍👍

  `:For, :If, …`

  `:Trap`

- New GUI objects 👍👍

  `'Window.Table' ⎕WC 'Grid'('TitleHeight' 0)`

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`OutIn:` **Mainframe File Transferring**

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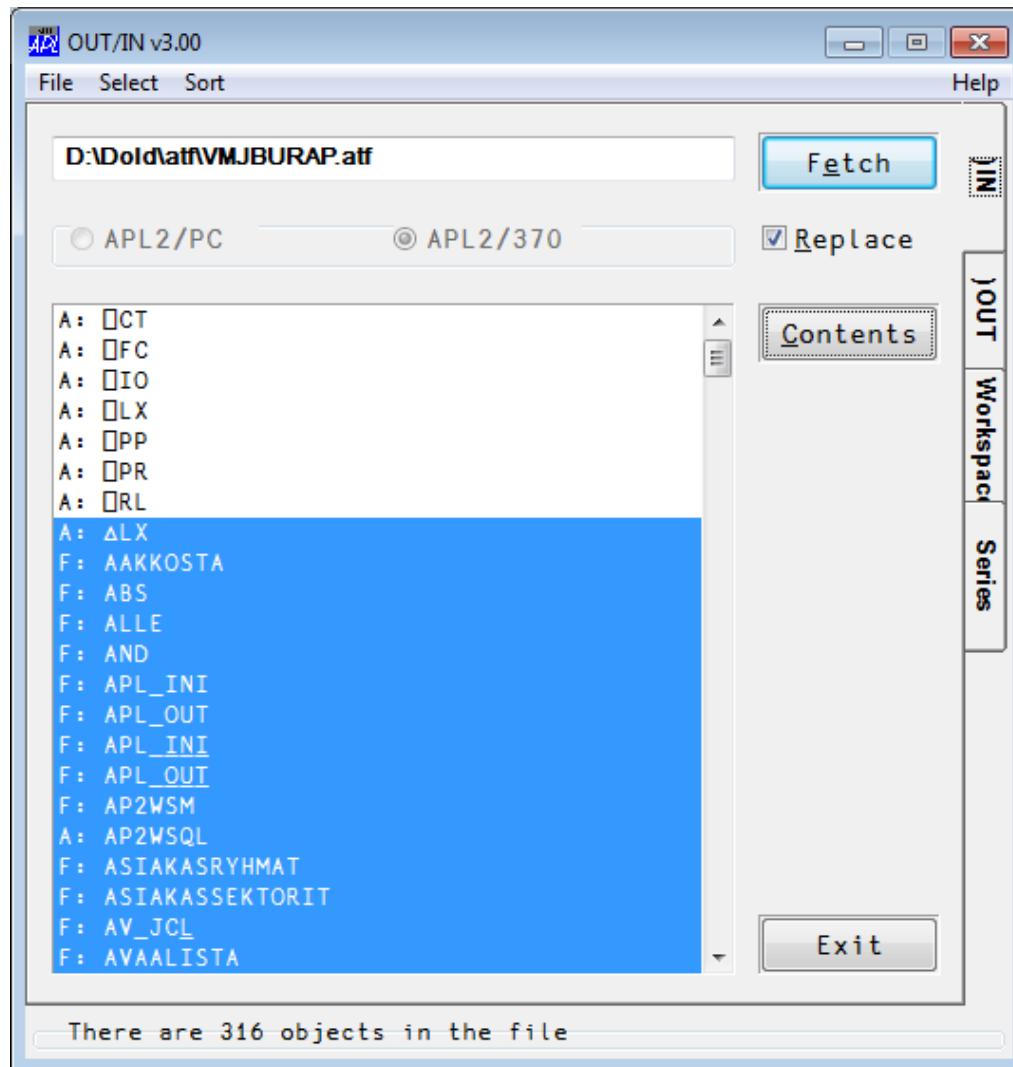
DyalogAPL 7.3 - 9.0 (1997-2002)

- **D-functions** for functional programming 👍👍👍👍

- Namespace references: `Window.BCol[2]←0` 👍👍
- Threads: `&` 👌
- Support for idioms: 👍
- Syntax colouring 👍
- Session log 👍

- .NET 👌👌👌
- PocketAPL 👌

- Adrian: *RainPro* 👍👍

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2000: Astika/W (Time Series Database)

2001: PX-Edit (Statistical Table Editor)

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DyalogAPL 10.0 – 11.0 (2003-2005)

- Function header enhancement

  `(a b c)←fun (x y z)` 👌   (still waiting for `{a b c}←…`)

- New or enhanced operators and functions: `⍣` 👌 , `⍠`, `∨` , `∧`

- Runtimes (`.exe`) 👍👍👍

- Objects: `⎕NEW` 👌👌

- File Mapping: `⎕MAP` 👍👍

- Name classes: `⎕NC⊂` 👎, `⎕NL ¯3.2` 👌

- Auto Complete 👍👍

- The First Dyalog Conference
- **Gitte & Morten** 👍👍👍

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DyalogAPL 12.0 – 12.1 (2008-2009)

- **Unicode** 👍👍👍
- ⎕XML 👍

- *I-beam* ⌶ 👌
- Event Viewer 👍👍
- *LanguageBar* 👌

- APL#
- SALT
  -]user commands 👍

- Conga 👌

- Legrand: *"Mastering Dyalog APL"* 👍👍

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PX-Edit 3.0

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DyalogAPL 13.0 – 13.2 (2011-2013)

- `⎕PROFILE` 👍👍 (why not shy result?)
- `⎕DMX`

- New functions, enhancements: `⊣`, `⊢` 👍, `↑`, `↓`, `⍠`
- New operators (*RegEx* 👌): `⎕R`, `⎕S`, `⍠`

- Complex numbers 👌 (not the angular types: `1D2` or `1R2`)
- Renewed random number generator 👌
- IME keyboards for Unicode input 👍👍

- [TryAPL.com](), [TryAPL.org]() 👍👍
- MiServer 👌
- *Array Editor* 👌

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The Current Finnish IME Keyboard

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DyalogAPL 14.0 – 14.1 (2014 - 2015)

- Function trains: (**+/** **÷** **≠**) 👍

- (Bytecode) Compiler control 👌

- Tally: **≠** 👍👍

- Rank: **⍤** 👌

- Key: **⌸** 👍

  - Unique items of a vector: `⊢⌸ vector`
  - Unique rows of a matrix: `⊢⌸ matrix`

- Row index of (enhanced **⍳**) 👍

- Inverted table index-of: 8**⍸** 👌

- JSON support 👍

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DyalogAPL 15.0 (2016)

- Performance improvements 👍👍👍

- **Free** Non-Commercial Licence 👍👍👍

- New native file functions 👍👍

  ⎕MKDIR, ⎕NDELETE, ⎕NEXISTS, ⎕NGET, ⎕NINFO, ⎕NPARTS, ⎕NPUT

- Case conversion:`(819⌶)array` 👍👍

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The Future Is Worth Waiting for… (2016-)

- Isolates and Futures 👌
  - ¤ , ∥ , ⌾

- New operators and functions
  - ⍠, ⍢, ⍧, @, ψ, ▣, ⍸👍, ≠👍, ⊆

- Rational numbers: `1597r987 355r113`

- Primes: ⍭

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