The Edinburgh
Pure Lisp Theorem Prover
(PLTP)

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1. ACL2 Evolved from PLTP

Many of the basic proof techniques and heuristics in ACL2 today were developed by Boyer and Moore in 1972–73 in Edinburgh, Scotland.

Those techniques were first implemented in the Pure Lisp Theorem Prover (PLTP).

PLTP was the first general purpose theorem prover designed for verification.
2. Proof Techniques Pioneered in PLTP

- Lisp as a logic for verification with if-then-else as the logical connective (see McCarthy)
- simplification – including heuristic expansion of recursive functions in symbolic evaluation
- fertilization and generalization – to set up subsequent inductions
- induction – driven by failures of symbolic evaluation

(Ad hoc heuristic approach due to Bledsoe)
3. First Automatic Proofs of Many Classic Thms

- append-associative
- rev-rev
- member-union
- ordered-sort
- count-sort
4. PLTP Archive:
~moore/best-ideas/pltp

- history, background, differences with ACL2
- listings of original POP-2 source code
- regression suite input and output
- relevant historic documents
- analysis of bugs in the code
- modern reconstructions in ACL2 and OCaml
5. PLTP(A)

• differences with PLTP

• how to play with it
1973

Some World Leaders:

<table>
<thead>
<tr>
<th>Country</th>
<th>Leader</th>
<th>Country</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>Richard Nixon</td>
<td>Soviet Union</td>
<td>Leonid Brezhnev</td>
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<tr>
<td>China</td>
<td>Mao Zedong</td>
<td>India</td>
<td>Indira Gandhi</td>
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<tr>
<td>Iran</td>
<td>Shah Pahlavi</td>
<td>Israel</td>
<td>Golda Meir</td>
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<td>Egypt</td>
<td>Anwar Sadat</td>
<td>Jordan</td>
<td>King Hussain</td>
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<td>Philippines</td>
<td>F Marcos</td>
<td>Spain</td>
<td>F Franco</td>
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<td>E Germany</td>
<td>E Honecker</td>
<td>W Germany</td>
<td>Willy Brandt</td>
</tr>
</tbody>
</table>

Events: EU founded; Yom Kippur War; Roe v Wade; Vietnam War “ends”; Watergate starts; US VP Agnew resigns

Births: Larry Page; Sergey Brin; Monica Lewinsky
Technical

*Popular Programming languages:* FORTRAN (1954); LISP (1958); COBOL (1959); Algol (1960)

*New Languages:* C (1972); Prolog (1972)

*Formal Methods:*

1949  Alan Turing *Checking a Large Routine*
1961  John McCarthy *Basis for a Math. Th. of Computation*
1965  J. A. Robinson *Machine-Oriented Logic Based on Resolution.*
1967  Robert Floyd *Assigning Meanings to Programs*

*Theorem Provers:* first-order resolution (no general support for arithmetic or inductive reasoning)
Computing Resources

64K of 2 $\mu$s core memory
2 paper tape readers
2 paper tape punches
3 4MB disc drives

control teleprinter
8 remote teleprinters
1 300 LMP lineprinter
Metamathematics Unit, Edinburgh
Boyer and Moore
Most Important Scanned Listings

- **Listing-F** and **Listing-H**: POP-2 code for prover (14 Sep 1973)

- **Listing-J**: Proveall output (18 July 1973)

*Note to Self:*

Listing-J, pg 2, pg 18
Listing-F, pg 1
Listing-H, pg 9, 8
Listing-F, pg 14, 5–8
Listing-H, pg 17, 14
PLTP(A): PLTP in ACL2

*Note to Self:* Shift to ACL2 and play with it as per `pltpa-demo.lisp`