

# Genesis of the Coq system

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Thierry Coquand Festschrift, Göteborg

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## My own personal saga - The seventies

- Aerospace engineer student puts his hands on a computer
- Maîtrise d'informatique, meets Schützenberger
- CWRU PDP10 LISP
- AI Resolution Equality
- Applied Logic Corporation, Jim Guard
- SAM is reversed-engineered in Peter
- Gould Church's type theory
- PhD Unification Type theory
- IRIA Böhm KB TRW Hullot
- SRI ACL Boyer & Moore

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- First prototype of proof checker in Caml started end 1983

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- Spirit of the time: predicativity vs impredicativity
- Predicativity as a philosophical topic of conversation
- Impredicativity as a threat or a moral fault
- I consult logic sommities: Krivine, Girard

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- Automath, Göteborg, Cornell's Nuprl, etc.

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- Gilles Kahn decides to organize a Types meeting in Sophia-Antipolis

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- The theory of constructions has not yet fully converged
- I allow multiple levels where Thierry insures consistency of a subsystem
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- My carefully crafted answer
- Thierry seated in the back keeps a poker face

## My meeting with Per

- I invite Per to join me for coffee on the terrasse

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- Dana's question
- My answer
- Dana's expected remarks

## 1985: Thierry's thesis

- Jan 1985 Une théorie des constructions
- Shortest dissertation ever
- CONSTR V1.10 22-12-1984 in Caml JIT
- Inspired from Automath and  $\Lambda$
- Abstract syntax vs Concrete syntax
- Formal mathematics in COC is fun
- Developing mathematics as weaving of a cloth
- Hugo Herbelin investigates metamathematics
- Christine Mohring (Paulin) investigates algorithms (Lambo!)
- Thierry adds Universes
- I hide them in elastic universes with delayed consistency

## 1985-1986 - The CMU year

- Formal Structures for Computation and Deduction - executable course
- Induction and recursion in COC
- Christine programs the infamous rec
- Surprise: Thierry starts programming
- Auto: a Prolog engine for automated proof search
- Gilles Dowek enters the team: mathematical vernacular, sections
- 86-87: Thierry spends a post-doc in Cambridge, visits Martin-Löf

## The Swedish connection

- Martin-Löf's Intuitionistic type theory: 1980
- The 1984 Bibliopolis monograph
- The Göteborg Programming methodology group
- Similar mixture of formalists and hackers as in Rocquencourt
- Mid-summer type theory meetings
- 1990 Programming in Martin-Löf's theory

## June 1989 - Midsummer in Båstad

- Every relevant researcher is on board









Nicholas de Bruijn with student





















# Premonition



Working hard

## Birth of Coq: 1989

- Stable and demonstrable platform Coq 4.10
- Reference Constructive Engine, Tutorial and Manual
- January 1989: Christine's thesis kills internal inductive types
- Calculus of Inductive Constructions: Thierry, Christine and Peter
- 1990: Thierry leaves for Göteborg
- 1991: Coq 5.6 with inductive types and induction tactic
- The Gilbreath trick - fun induction challenge
- 1992 Coq 5.7 runs on Caml-light - exit LISP - took 10 years

# The Edinburgh demo

- Basic Research Action: Logical Frameworks
- The May 1995 Edinburgh demo
- Allez France
- In search of a rooster mascot
- Cocorico !
- The Gilbreath trick with Rogloglo's gif animation

## The Coq team 1990-2000

- Re-engineering with Caml-light
- Chet Murthy new software architect 93-95
- Benjamin Werner extraction 5-94
- Catherine Parent Program: co-extraction 1-95
- Samuel Boutin quotients reflexion 97
- Amokrane Saïbi canonical structures 99
- Bruno Barras bootstrap Coq in Coq 99
- Trusted Logic certification of Javacard model
- I left the team and the field at the end of 1996

## Aftermath

- In 2000 Georges Gonthier starts his 4-Color “pet project”
- More recently, Xavier succeeds with CompCert
- Coq is now a mature tool for serious maths and certified programming

Thank you for your attention