Programming Methodology and Type Theory
How 40 years of uncompromising research made concrete the Chalmers futuristic vision into the Software Engineering paradigm of Programs correct by construction

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When Chet Murthy left the Coq project to join IBM, he said: Formal Methods are the way of the future ...
When Chet Murthy left the Coq project to join IBM, he said: Formal Methods are the way of the future ... and they always will be.
Irrelevance for commercial software development

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Relevance to serious programming

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- Lisp

Nowadays, the banking business is taking seriously functional programming.
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- Correctness by construction
Programming Methodology at Chalmers

• It started in Midsummer 1979
• Martin-Löf’s lectures in Padua June 1980
• Edited as “Intuitionistic Type Theory” studies in Proof Theory 1984
• There was this intriguing series of summer workshops in wonderful places such as Marstrand and Båstad
• It attracted researchers curious about this new trend
• The types meeting organized by Gilles Kahn in 1984 in Sophia-Antipolis
• Programming in Martin-Löf’s Type Theory 1990
• ESPRIT Basic Research Actions Logical Frameworks, then Types
• BRA consistency with the uncompromising attitude
• Long term goals are solved by “doing things right”, a commitment to quality
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40 years of uncompromising research
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Persistency vs obstinacy vs stubbornness
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Swedish qualities?
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Indulging in stereotypes and flirting with political incorrectness, again
40 years of uncompromising research

Persistency vs obstinacy vs stubbornness
Swedish qualities?
Indulging in stereotypes and flirting with political incorrectness, again
Blacklisted for 20 years, and still number one on the hit list
Swedish bashing
Swedish bashing

hard-working
Swedish bashing

hard-working
methodic
Swedish bashing

hard-working
methodic
honest
hard-working
methodic
honest

Where once the Indian to the death
Chased pioneer and scout,
The Swede, with alcoholic breath,
Sets rows of cabbage out.
The art of the research team leader
The art of the research team leader

Administration is not Science
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Thus sane researchers avoid administration duties
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But research needs resources, and money is controled by Law
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But research needs resources, and money is controled by Law
Thus the research team leader must deal with legalities
The research team leader is a facilitator and he makes administration transparent
For efficiency, he must learn the rules, and apply his scientific skills to remove obstacles in a legal way
The science of creative bureaucracy

Learn the rules, and remove the opaque veil that the bureaucrats carefully maintain between you and them.

Know the rules better than the bureaucrat in charge of regulating your requests.

Defeat the opponent using game theory, logic, and psychology.

Winning by putting the opponent on your side.

Frighten the bureaucrat using your natural endowments.

Use logic to prove that obstacles may be bypassed.

Law is to forbid illegal acts, and anything not forbidden is legal.

The problem with Catch 22: inconsistent laws.

Instill a feeling of guilt into bureaucrats by pointing out the inconsistency of rules.

This is a dangerous path, sometimes it is better to keep your mouth shut.
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How Turing won the game of firearm training without enlistment
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Don’t lie, but sometimes keep silent with a poker face
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Use epistemic logic to profit of your opponent ignorance
Don’t lie, but sometimes keep silent with a poker face
But be persistent, and get your ways by hook or by crook
The game of creative bureaucracy

The art of detecting loopholes and using them to bypass obstacles
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Then have him or her repeat the argument, step by step
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Nod approval at every step
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At QED jump and exclaim “you got it”
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Then have him or her repeat the argument, step by step
Nod approval at every step
At QED jump and exclaim “you got it”
Now act as if the bureaucrat had the idea in the first place, compliment him/her for it, and state your obedience to the process: Yes, we can!
Mandatory readings

• Joseph Heller. Catch 22
• Robert Pirsig. Zen and the Art of Motorcycle Maintenance
• Eugen Herrigel. Zen and the Art of Archery
• Jerry Rubin. Do it!
• Edward Conze. The Memoirs of a Modern Gnostic