

**2002-**

**“Memorability and Invisibility:  
A tale of two alarm clocks and other stories  
from the front line.”**

by

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Version 1.1: 26/Aug/2002

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# *Disclaimer*

*The author's cynicism, withering sarcasm and general dismay at many aspects of computing do not in any way derive from the views of his colleagues at the University of Kent Computing Laboratory.*

*He has arrived at this position all on his own aided only by 30 years of working in industry.*

*Although it may not be immediately apparent, he remains an optimist.*



# Overview

- ❖ **Memorability and invisibility in interfaces: the light side**
  - Some general comments on complexity
  - A categorisation of complexity stolen from lawyers
  - Some case histories
    - ◆ A tale of two alarm clocks
    - ◆ Bugs in the underlying infrastructure
    - ◆ Mobile phone tariffs
- ❖ **Memorability and invisibility for defects: the dark side**



# *General comments on complexity in interfaces*

- ❖ **Memorability and invisibility are directly related to complexity in interfaces.**
- ❖ **There is no such thing as HCI (Human Computer interaction); there is only HHI (Human Human interaction.)**
  - Note: this makes the relatively ambitious assumption that all programmers are human. This is easier to believe if you don't visit computer fairs.



# *General comments on complexity in interfaces*

## ❖ I will use the word *Interface* in the following broad way:

- An interface is the medium across which a two-way transfer of information takes place between two sets of people, whom we shall call the *controllers* and the *victims*. This might well be through the medium of software but could equally well be a written set of instructions.
- In this sense an interface is very like a legal contract.



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# *Dancing with wolves: stealing from lawyers*

- ❖ **The legal profession at least in England and Wales defines the following ways of misleading people when contracts are formed:**
  - Innocent misrepresentation
    - ◆ Wholly innocent false statement
  - Negligent misrepresentation
    - ◆ Non-fraudulent false statement but a special relationship exists and the person making the statement should have known better
  - Fraudulent misrepresentation
    - ◆ False statement made with intent to deceive



# *Dancing with wolves, part 2*

## ❖ **Lets define the following categories of obfuscation for interfaces**

### – Innocent Obfuscation or IO

- ◆ Overly complex interface designed accidentally by untrained person or organisation

### – Negligent Obfuscation or NO

- ◆ Overly complex interface designed by person or organisation that should know better

### – Fraudulent Obfuscation or FO

- ◆ Overly complex interface designed deliberately to mislead



# Overview

## ❖ Memorability and invisibility in interfaces: the light side

- Some general comments on complexity
- A categorisation of complexity stolen from lawyers
- **Some case histories**
  - ◆ A tale of two alarm clocks, innocent obfuscation
  - ◆ Bugs in the underlying infrastructure, negligent obfuscation
  - ◆ Mobile phone tariffs, fraudulent obfuscation

## ❖ Memorability and invisibility for defects: the dark side



# *A tale of two alarm clocks*

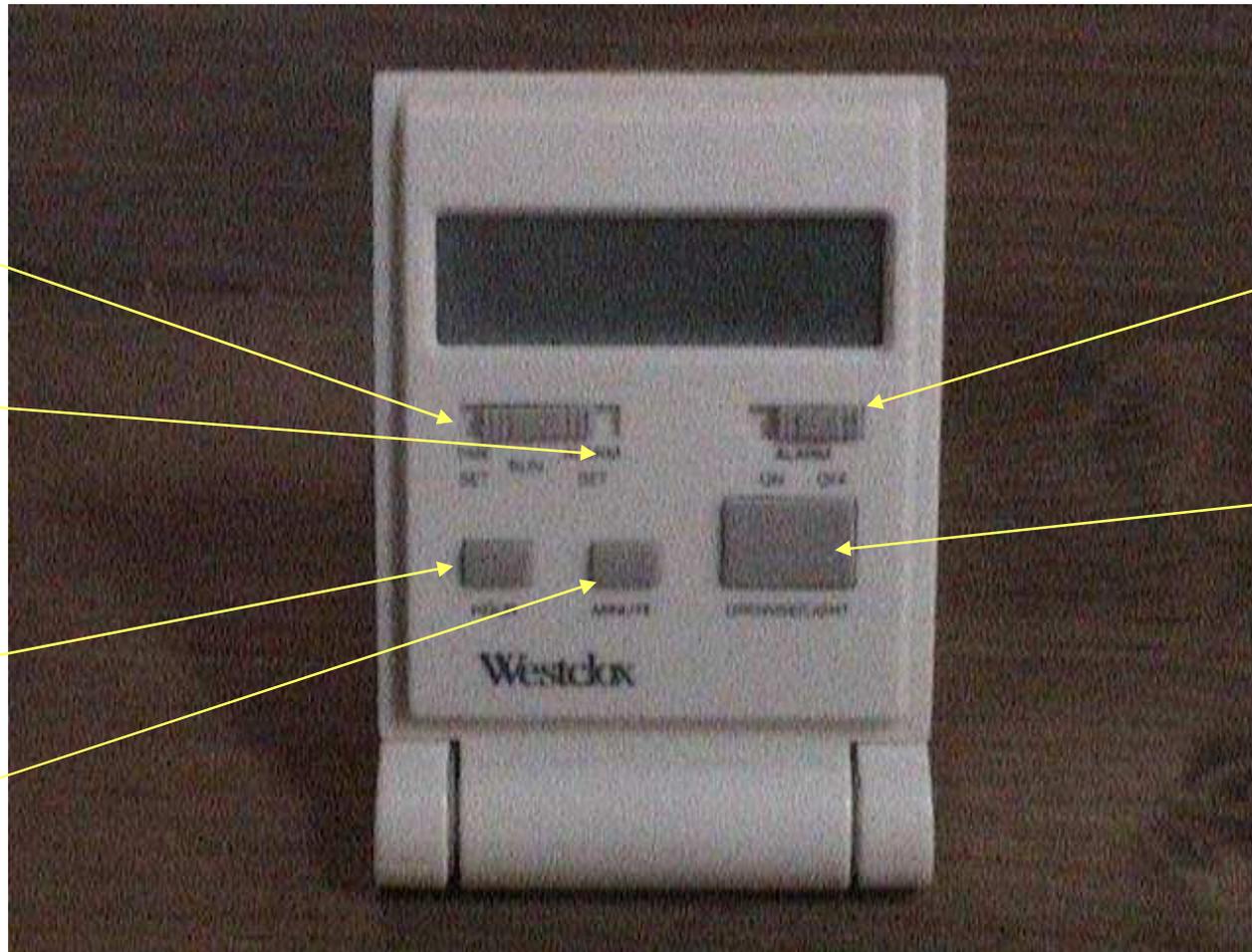
## **Innocent obfuscation:-**

### **❖ Alarm clock 1**

- Purchased 5 years ago and faultless ever since.
- Staggeringly simple and intuitively obvious interface which has never required the instructions to be consulted.



# *A tale of two alarm clocks – the sublime*



Time set

Alarm set

Hour

Minute

Alarm  
On/off

Drowse



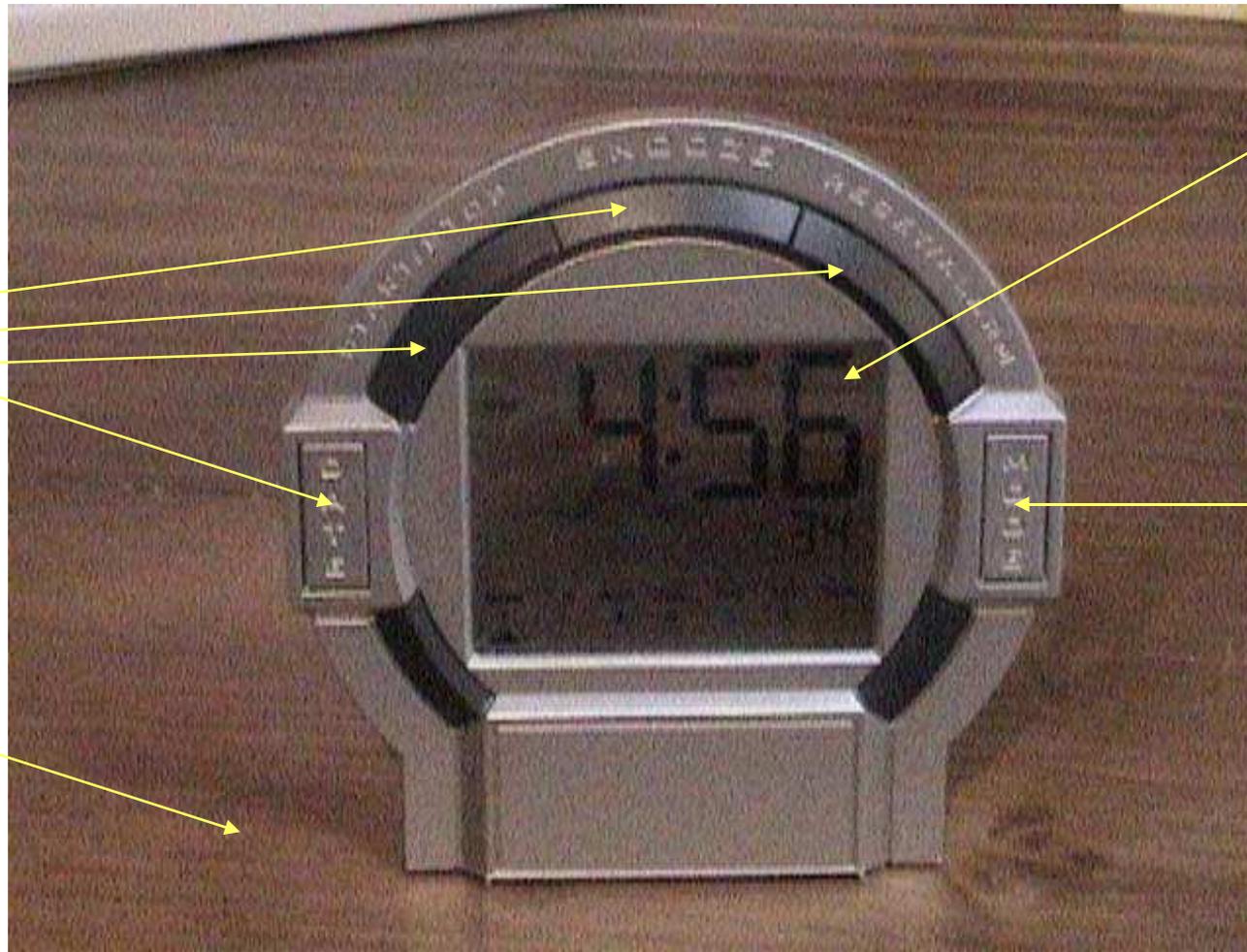
# *A tale of two alarm clocks*

## ❖ **Alarm clock 2**

- Purchased 1 year ago and frequently resets itself
- Staggeringly complex and intuitively non-obvious interface.



# *A tale of two alarm clocks – the ridiculous*



More  
buttons

Random  
numbers

Mode  
- ARGH !

Desk



# *A tale of two alarm clocks*

## ❖ **Alarm clock 2 – some examples**

- Time setting
  - ◆ Press MODE button THREE times. Then press SELECT and SET repeatedly.
- Alarm setting
  - ◆ Press MODE button TWO times. Then follow time setting.
- Hourly chime on/off
  - ◆ Press SELECT and MODE button *simultaneously*
- Alarm on
  - ◆ Press DATE and SELECT button *simultaneously*
- Stop watch / lap counter
  - ◆ Press MODE button ONCE and then beg for mercy as clock gibbers with entertaining series of random beeps.
- Turning alarm off
  - ◆ Hurl out of window after standing on clock screaming.



# *A tale of two alarm clocks*

**If only it was just alarm clocks ...**



# *Memorability and visibility in a flight management system*

## **An example from real life, Airbus A320 AF319, 25/8/88, (Mellor (1994)):-**

- MAN PITCH TRIM ONLY, followed in quick succession by ...
- Fault in right main landing gear
- Fault in electrical flight control system computer 2
- Fault in alternate ground spoilers 1-2-3-5
- Fault in left pitch control green hydraulic circuit
- Loss of attitude protection
- Fault in Air Data System 2
- Autopilot 2 shown as engaged when it was disengaged
- LAVATORY SMOKE



# *Memorability and visibility in a flight management system*

## **“Button push ignored”**

- This appears on the Flight Management System of a McDonnell-Douglas MD-11, (Drury (1997))

It is not clear what the programmer is trying to convey. “Paris is the capital of France” would have been equally useful.

- The pilot also noted *“The airplane [computer system] manuals were written as though by creatures from another planet”*.



# *Bugs in the underlying infrastructure*

## **Negligent obfuscation:-**

**“Upgrade now to our portable interface library and reap the benefits for years to come”**

(From an advertising brochure in 1995 which the author fell for).

**To understand this better think of *reap* in the biblical sense.**



# *English for computer practitioners*

## **benefit, n. (OED)**

– Advantage

*but note also:-*

– Assuming innocence rather than guilt

– Exemption from ordinary courts by the privilege of one's order

– Performance at theatre, game, etc. of which proceeds go to particular players



# *Bugs in the underlying infrastructure*

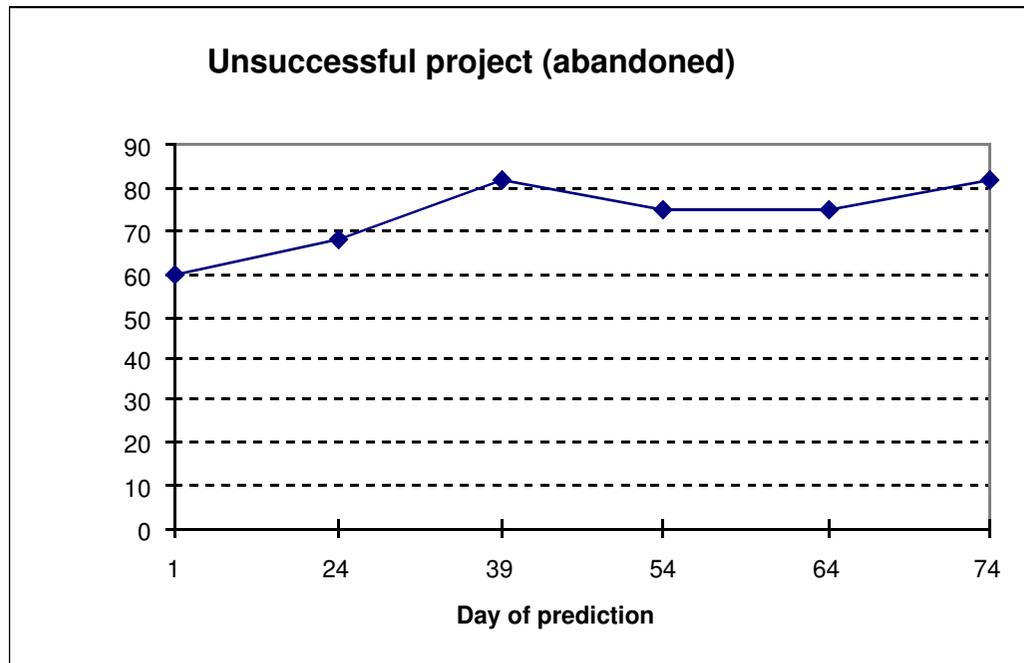
## ❖ **What really happened:-**

- The interface library was presented as fully portable between Windows platforms and Unix platforms
- The reality: enormous numbers of bugs and inconsistencies initially requiring work-arounds, then re-design and eventually abandonment. The library was simply too complicated and ambitious, (as well as over-gilded and over-sold).



# *When the train of ambition pulls away from the platform of reality*

Predicted days  
To completion



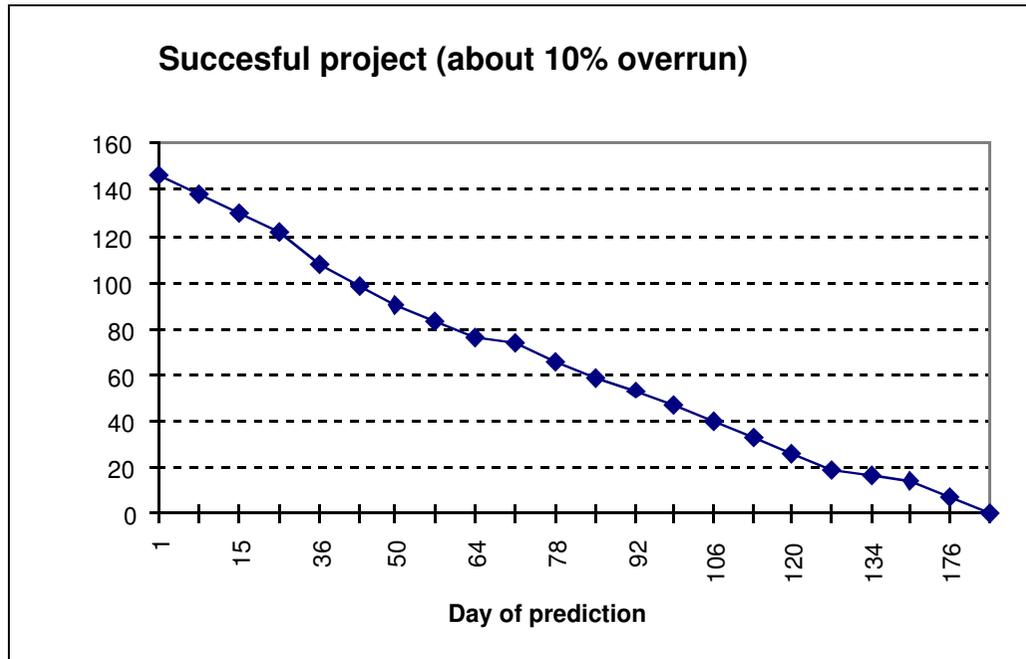
Planning data from a grand **'unified'** portable interface project.  
(Produced after the project seemed to be struggling.)

Note that *unify* appears next to *unintelligible* in the OCD.



# *Back to square 1*

Predicted days  
To completion



Project restarted with (far) less ambitious goals and tracked weekly with results published on staff notice board.



# *To plan or not to plan ? – a useful post-mortem*

*“Planning is an unnatural process. Its much more fun to get on with it. The real benefit of not planning is that failure comes as a complete surprise and is not preceded by months of worry.”*

Sir John Harvey Jones.



# Mobile phone tariffs □

## Fraudulent obfuscation:-

❖ **Specifically designed to hide the truth otherwise people would just take the cheapest. Note the following:-**

- Short excerpt from current supplier:-
  - ◆ “Text allowance messages do not apply to group text, text chat, text play or text game messaging and are not available in conjunction with any share plan. Allowances apply to all messages sent for the XXXX text play and info services, and to all text messages sent and received in relation to the text chat service. Allowances are only available in conjunction with current price plans. Interactive text allowances are not available in conjunction with XXXX 750. *Rollover of your text allowance.* Interactive text allowances and WAP allowance will apply if your price plan provides rollover of unused minutes each month ... blah blah blah.
  - ◆ In spite of all this garf, it still doesn't say explicitly that bonus minutes are taken from tariffs in increasing order of cost.
- There are around 40 identifiable distinct plans from 4 main suppliers all of which provide additional arbitrary, time-dependent non-linear options



# *Mobile phone tariffs* □

**Mobile phone tariffs fall into a branch of mathematics which I will call *fuzzy global optimisation*. You could also call it *robust optimisation in the presence of incomplete, inconsistent and mischievously arbitrary constraints*.**

- To solve this problem requires a fair degree of computation as relatively large numbers of disposable parameters are necessary.
- Think of it as trying to compare supermarkets.

**Demonstration ...**



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# *Memorability and Invisibility are not good properties of defects*

**Defects are entirely different to interfaces in their desirable properties**

❖ **Memorability**

- This is the last thing you want !

❖ **Invisibility**

- Defects don't remain visible for ever but they *can* remain invisible for a very long time before surfacing embarrassingly. Defects should be highly visible so they are found early.



# *Memorability* □

## **Software safety defect hits BMW**

- **20/May/2002.** 2000 top of the range BMW cars had to be recalled because of a software defect in the fuel injection pump.



# *Memorability* □

## **Air-traffic control problems**

- The new UK National Air Traffic System (NATS) stopped three times in 5 weeks in April-May 2002 causing huge delays. Each time was due to a different kind of software failure.
- This system cost around \$600 million and was 6 years late.



# *Memorability* □

## **More web problems**

- The new UK online tax return system introduced in 2002 was temporarily withdrawn in May 2002 because the software did not clear the form properly before the next person used it leaving confidential details visible.



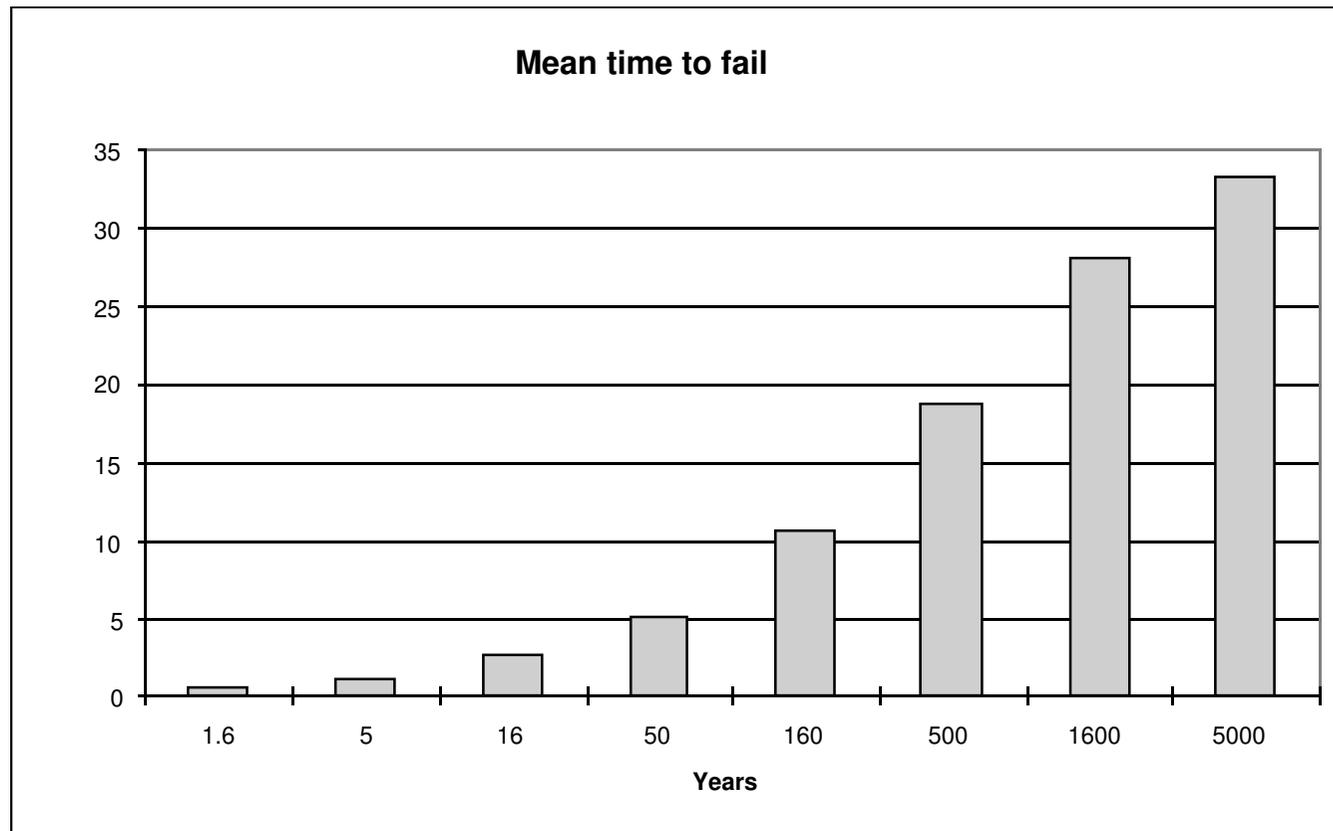
# *Invisibility is not a good property of defects*

**A famous study by Adams (1984) showed that around one third of all defects took longer than 5000 execution years to surface.**

If you find this hard to believe consider the following 1000-2000 year defects found in seismic data processing software as used in oil and gas exploration.



# *Mean time to fail in Adams (1984)*



# *Memorability and Invisibility are not good properties of defects*

## **Details of study:-**

- 9 sets of software with same published mathematical specifications but developed independently in fiercely competitive environment
- Same data, (actually the same input tapes)
- Same disposable parameter values
- Same programming language
- Each package contained around 1,000,000 lines of code of which around 10% was 'exercised'.
- Data is subjected to 14 processes in a pipeline, (the input of process N+1 is the output of process N,  $1 \leq N \leq 13$ ). Process 1 reads the input tape.



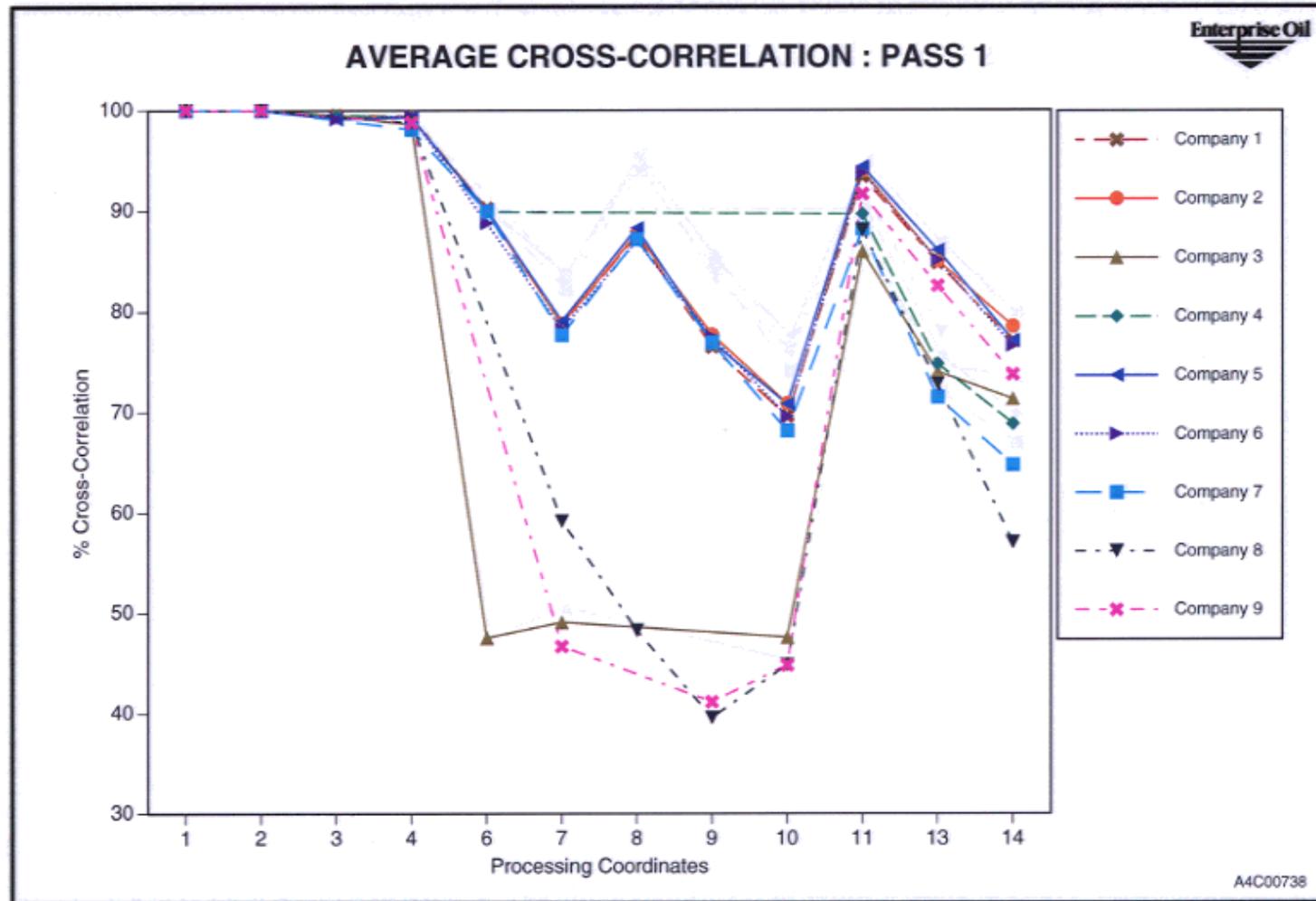
# *How to collect seismic data*

Borrow around 10 million pounds and buy one of these ☐

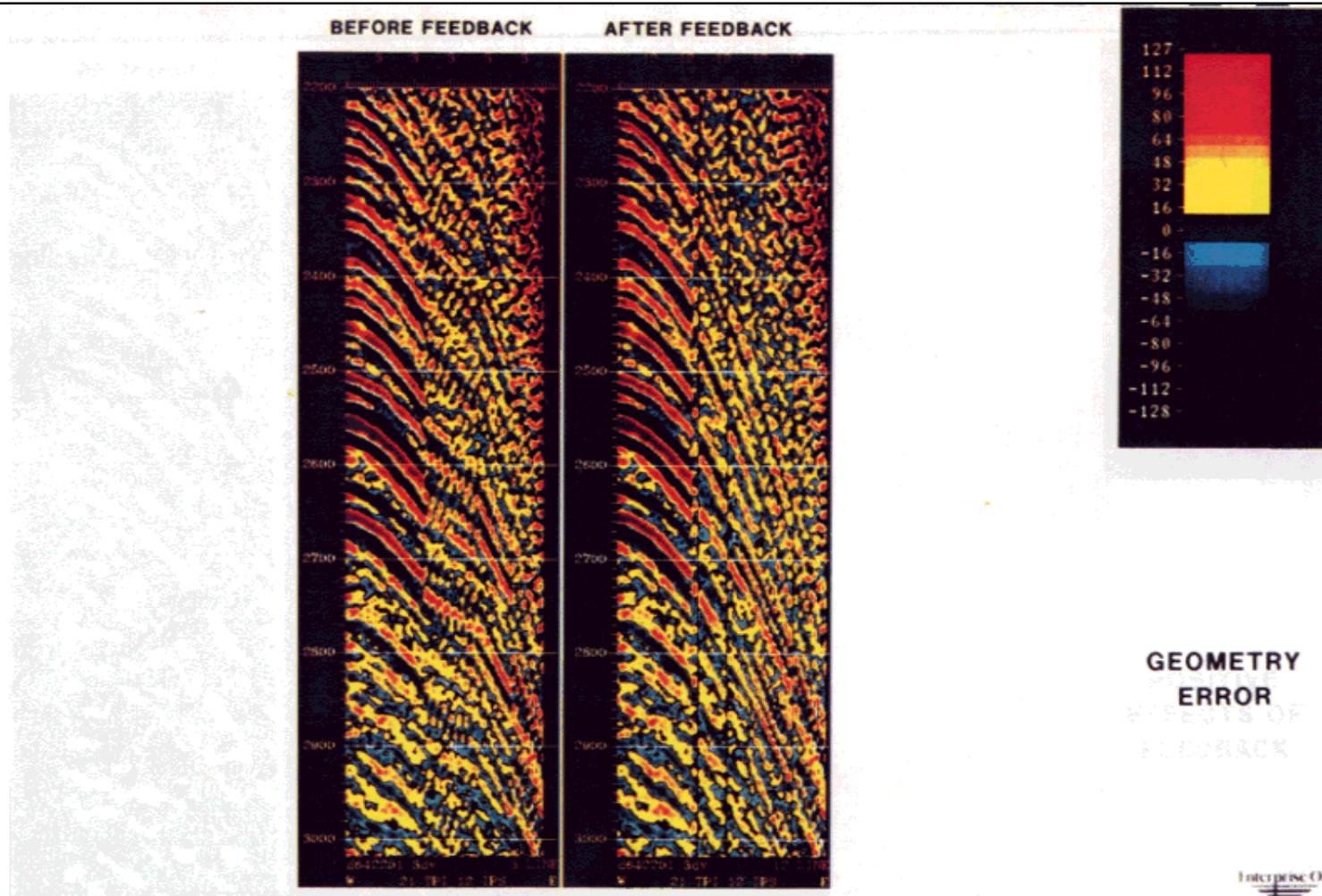
If it doesn't work out you can always run booze cruises.



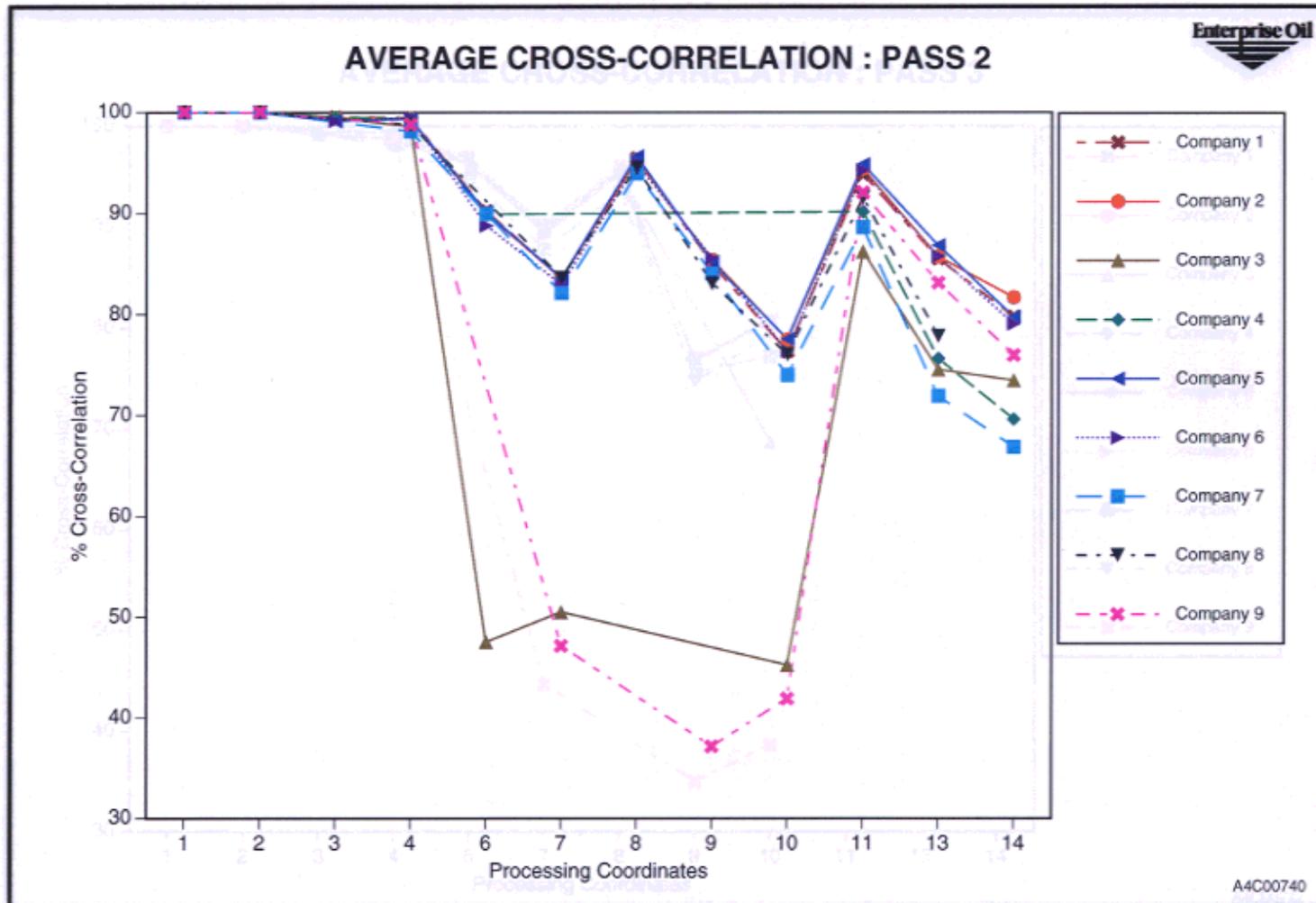
# Similarity v. coordinate: No feedback



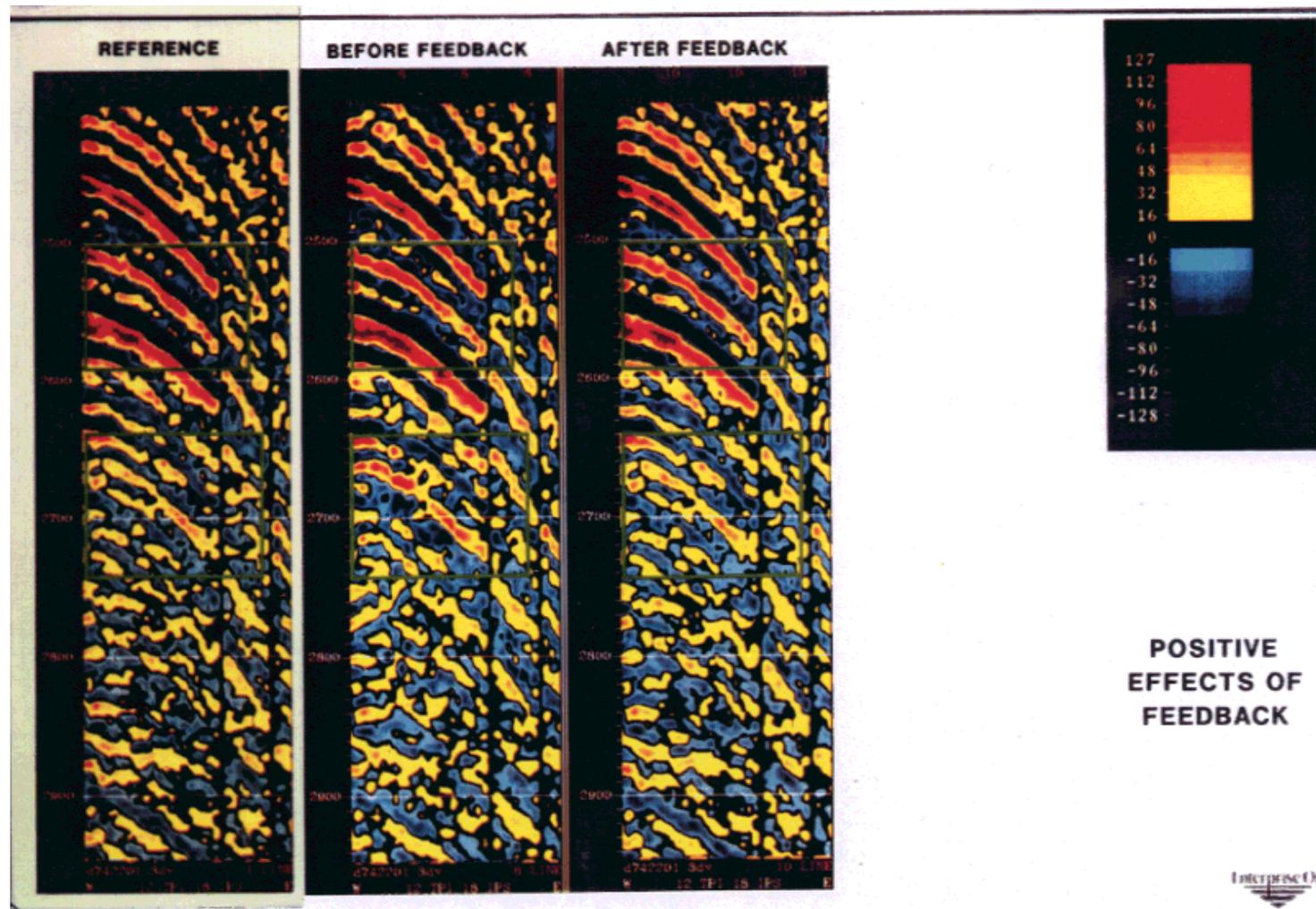
# *Defect example 1: feedback detail*



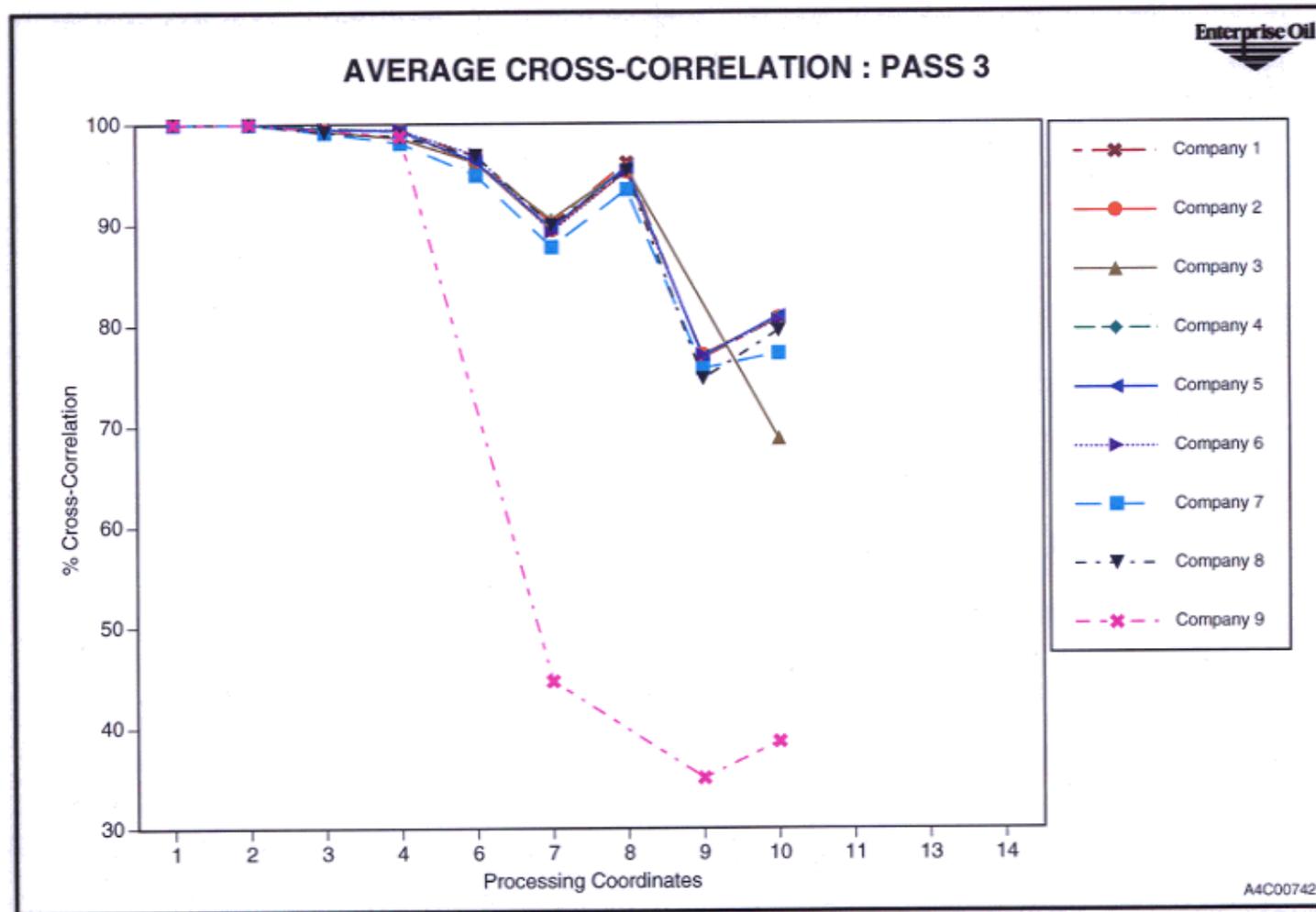
# Similarity v. coordinate: Feedback to company 8



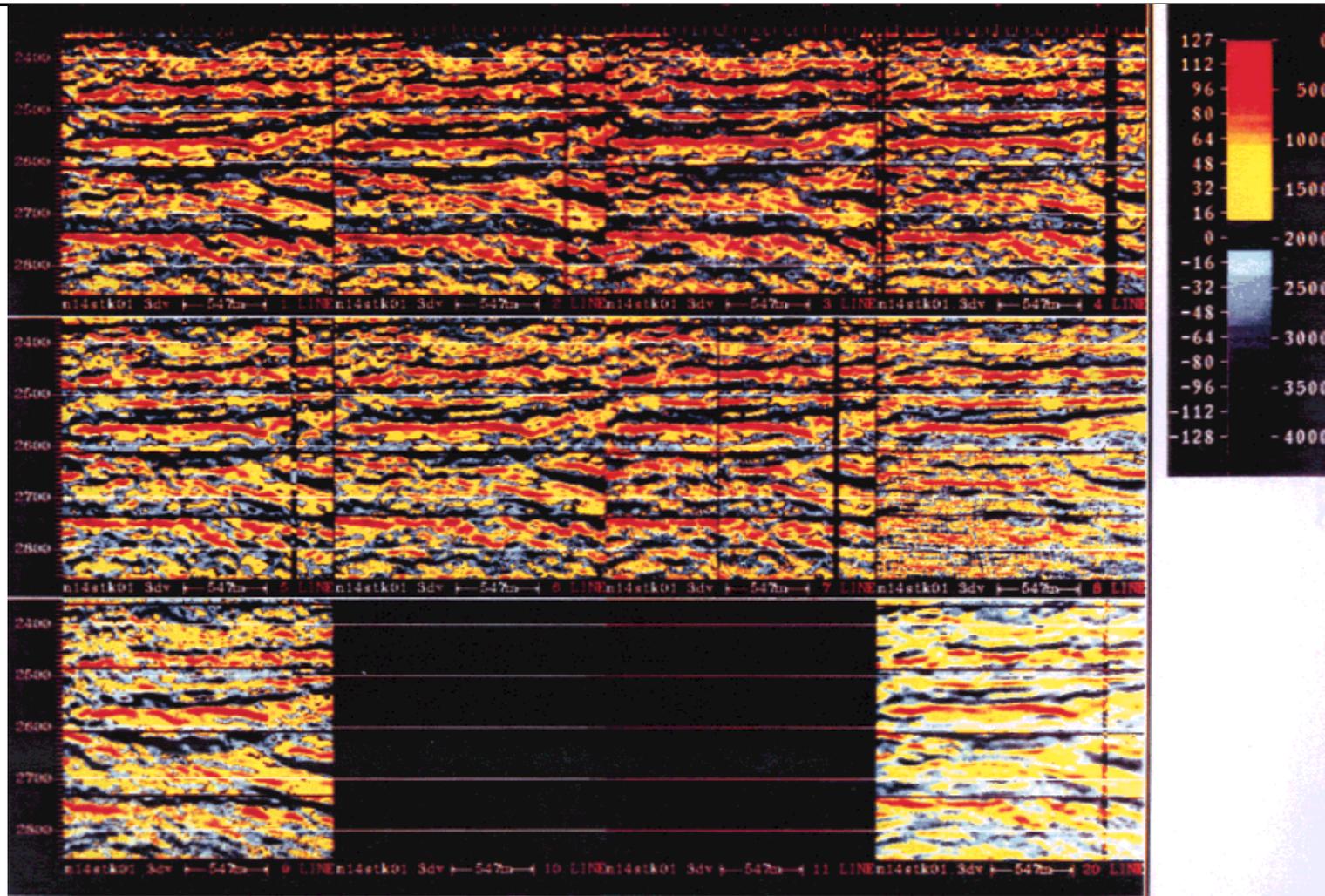
# *Defect example 2: feedback detail*



# Similarity v. coordinate: Feedback to company 3



# *The end product: 9 subtly different views of the geology*



# *The outcome ...*

## ❖ **Useful lessons**

- The feedback stages took between 3-6 months each. In each case a software defect was responsible for the recorded differences
- Defects can have exceptionally long lives and can cost a fortune

## ❖ **How to cover up the evidence:-**

- Company 1 simply bought all the other companies and threw their software away. (This is called the 'market forces software engineering model'.)

**Speaking of which ...**



# *(The™ avalanche™ model™ of™ software™ engineering™)™*

## ❖ **How to build modern software:-**

- Think of a good idea
- Add bugs and incomprehensible interface
- Release
- Crush™ competition™ ruthlessly™

**Surely we can do better than this ?**

