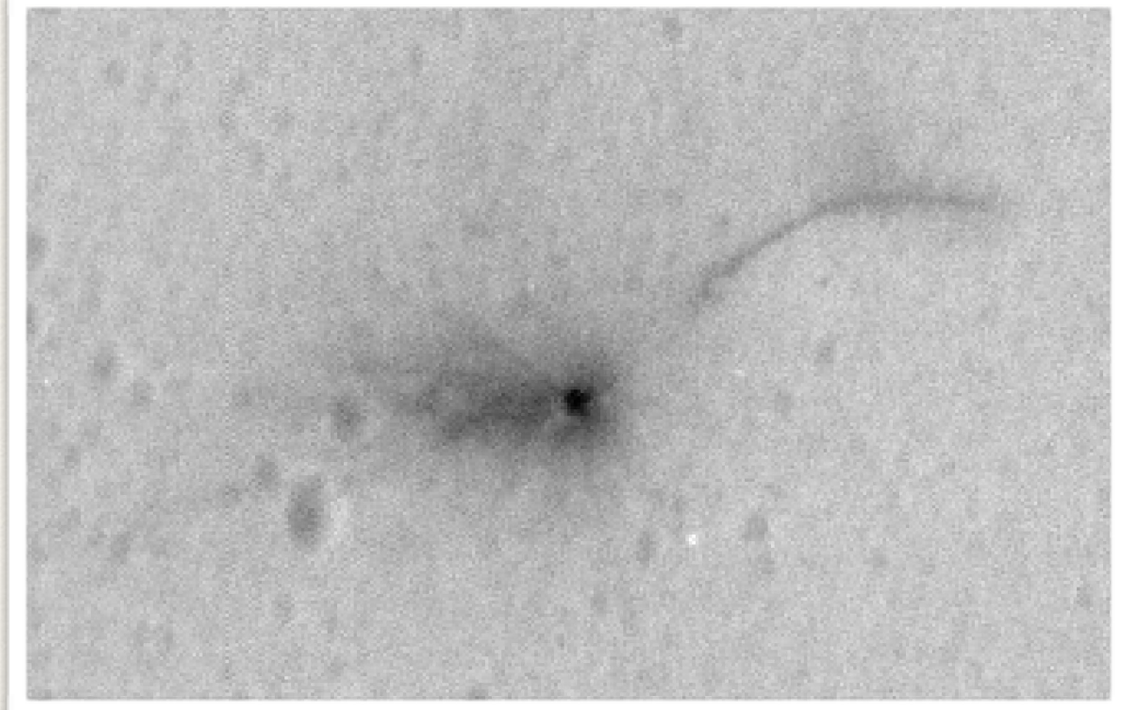
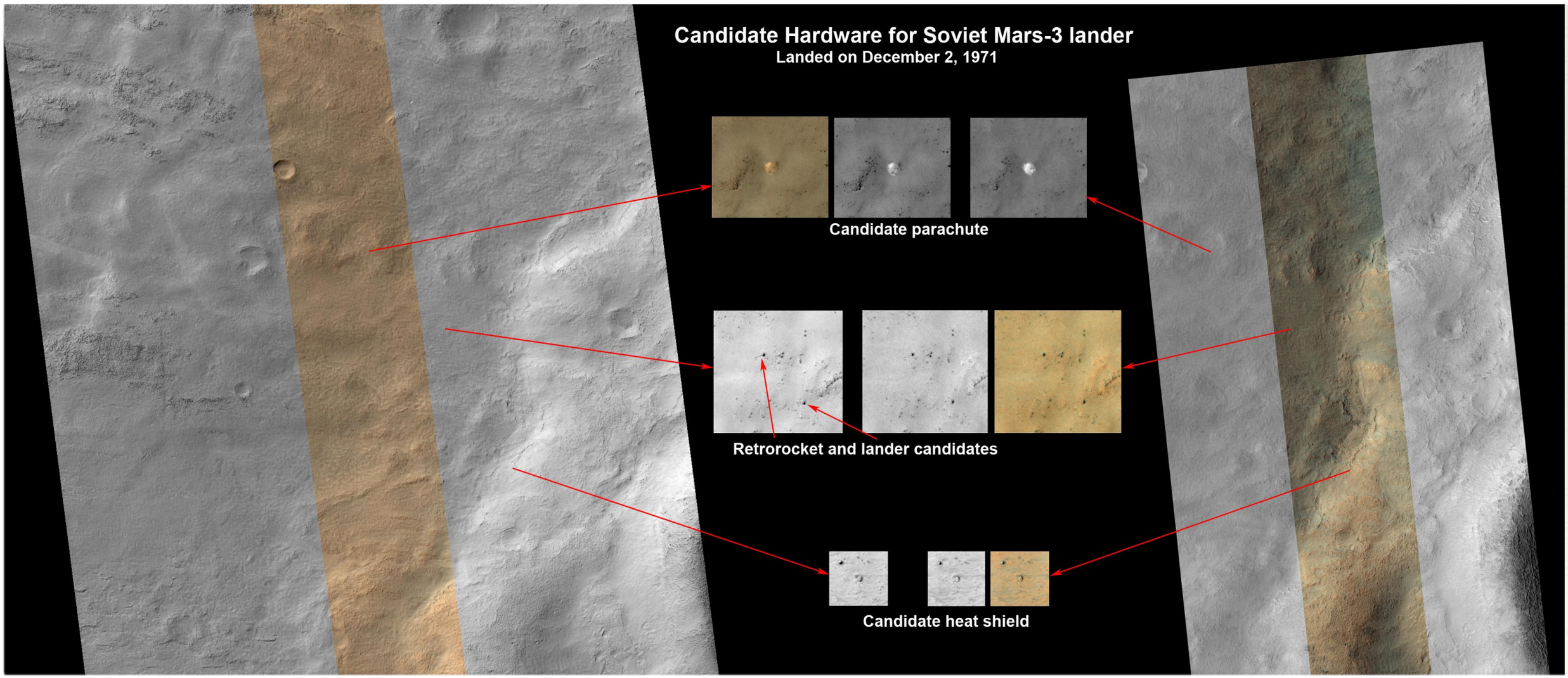
*For FSW 2016*

# 100% Success

David Smyth
President
Westlawn Institute


Success %
50.0%
37.5%
25.0%
12.5%
0.0%




Candidate Hardware for Soviet Mars-3 lander
Landed on December 2, 1971
Candidate parachute
Retrorocket and lander candidates
Candidate heat shield

| Name | Type | Who | Launch Date | Result | MPF Arch | OK | Try | % |
|---|---|---|---|---|---|---|---|---|
| **ExoMars Trace Gas Orbiter** | Orbiter | ESA Roscosmos | March 14, 2016 | Operational | | 1 | 51 | 45.1% |
| **ExoMars Schiaparelli** | Lander | ESA Roscosmos | March 14, 2016 | Crashed on Mars | | 0 | 50 | 44.0% |
| **Maven** | Orbiter | NASA | November 18, 2013 | Operational | | 1 | 49 | 44.9% |
| **Mangalyaan** | Orbiter | ISRO India | November 5, 2013 | Operational | | 1 | 48 | 43.8% |
| **Phobos sample return mission** | Lander (Phobos) | Roscosmos | January 15, 2012 | Upper stage launch failure | | 0 | 47 | 42.6% |
| **Yinghuo-1** | Orbiter | China | January 15, 2012 | Upper stage launch failure | | 0 | 46 | 43.5% |
| **Curiosity** | Rover | NASA | November 26, 2011 | Operational | MPF | 1 | 45 | 44.4% |
| **Phoenix** | Lander | NASA | August 4, 2007 | Successful (~5 mo to EOM) | | 1 | 44 | 43.2% |
| **Mars Reconnaissance Orbiter** | Orbiter | NASA | August 12, 2005 | Operational | MPF-LM? | 1 | 43 | 41.9% |
| **Opportunity** | Rover | NASA | July 7, 2003 | Operational | MPF | 1 | 42 | 40.5% |
| **Spirit** | Rover | NASA | June 10, 2003 | Successful (~6.2 yrs to EOM) | MPF | 1 | 41 | 39.0% |
| **Mars Express** | Orbiter | ESA | June 2, 2003 | Operational | | 1 | 40 | 37.5% |
| **Beagle 2** | Lander | ESA | June 2, 2003 | Lost | | 0 | 39 | 35.9% |
| **2001 Mars Odyssey** | Orbiter | NASA | April 7, 2001 | Operational | MPF-LM | 1 | 38 | 36.8% |
| **Mars Polar Lander** | Lander | NASA | January 3, 1999 | Crashed on Mars | | 0 | 37 | 35.1% |
| **Amundsen and Scott** | 2 Penetrators | NASA | January 3, 1999 | Lost | | 0 | 36 | 36.1% |
| **Mars Climate Orbiter** | Orbiter | NASA | December 11, 1998 | Missed MOI due to unit error | | 0 | 35 | 37.1% |
| **Nozomi** | Orbiter | ISAS @ U of Tokyo | July 4, 1998 | Fail during cruise to Mars | | 0 | 34 | 38.2% |
| **Mars Pathfinder (Sagan & Sojourner)** | Lander & Rover | NASA | December 4, 1996 | Successful (~3 mo to EOM) | MPF | 1 | 33 | 39.4% |
| **Mars 96** | Orbiter, Lander, 2 Penetrators | Roscosmos | November 16, 1996 | Upper stage launch failure | | 0 | 32 | 37.5% |
| **Mars Global Surveyor** | Orbiter | NASA | November 7, 1996 | Successful (~9 yrs to EOM) | | 1 | 31 | 38.7% |
| **Mars Observer** | Orbiter | NASA | September 25, 1992 | Lost (fuel line rupture?) | | 0 | 30 | 36.7% |
| **Phobos 2** | Orbiter and 2 Phobos landers | RSA | July 12, 1988 | Computer failure during Mars orbit maneuver | | 0 | 29 | 37.9% |
| **Phobos 1** | Orbiter | RSA | July 7, 1988 | Software upload disabled ACS | | 0 | 28 | 39.3% |
| **Viking 2 Lander** | Lander | NASA | September 9, 1975 | Successful (~2.5 yrs to battery failure) | | 1 | 27 | 40.7% |
| **Viking 2 Orbiter** | Orbiter | NASA | September 9, 1975 | Successful (~2 yrs to EOM) | | 1 | 26 | 38.5% |
| **Viking 1 Lander** | Lander | NASA | August 20, 1975 | Successful (~6 yrs to bad software upload) | | 1 | 25 | 36.0% |
| **Viking 1 Orbiter** | Orbiter | NASA | August 20, 1975 | Successful (~4 yrs to EOM) | | 1 | 24 | 33.3% |
| **Mars 7** | Flyby and lander | RSA | August 9, 1973 | Fail (missed planet) | | 0 | 23 | 30.4% |
| **Mars 6** | Flyby and lander | RSA | August 5, 1973 | OK (some descent and flyby data, failure before landing) | | 0 | 22 | 31.8% |
| **Mars 5** | Orbiter | RSA | July 25, 1973 | Success (~22 days to failure) | | 1 | 21 | 33.3% |
| **Mars 4** | Orbiter | RSA | July 21, 1973 | Flyby, failed MOI | | 0 | 20 | 30.0% |
| **Mariner 9** | Orbiter | NASA | May 30, 1971 | Success (~ 1 year to out-of-fuel EOM) | | 1 | 19 | 31.6% |
| **Mars 3 Orbiter** | Orbiter | RSA | May 28, 1971 | Successful orbiter | | 1 | 18 | 27.8% |

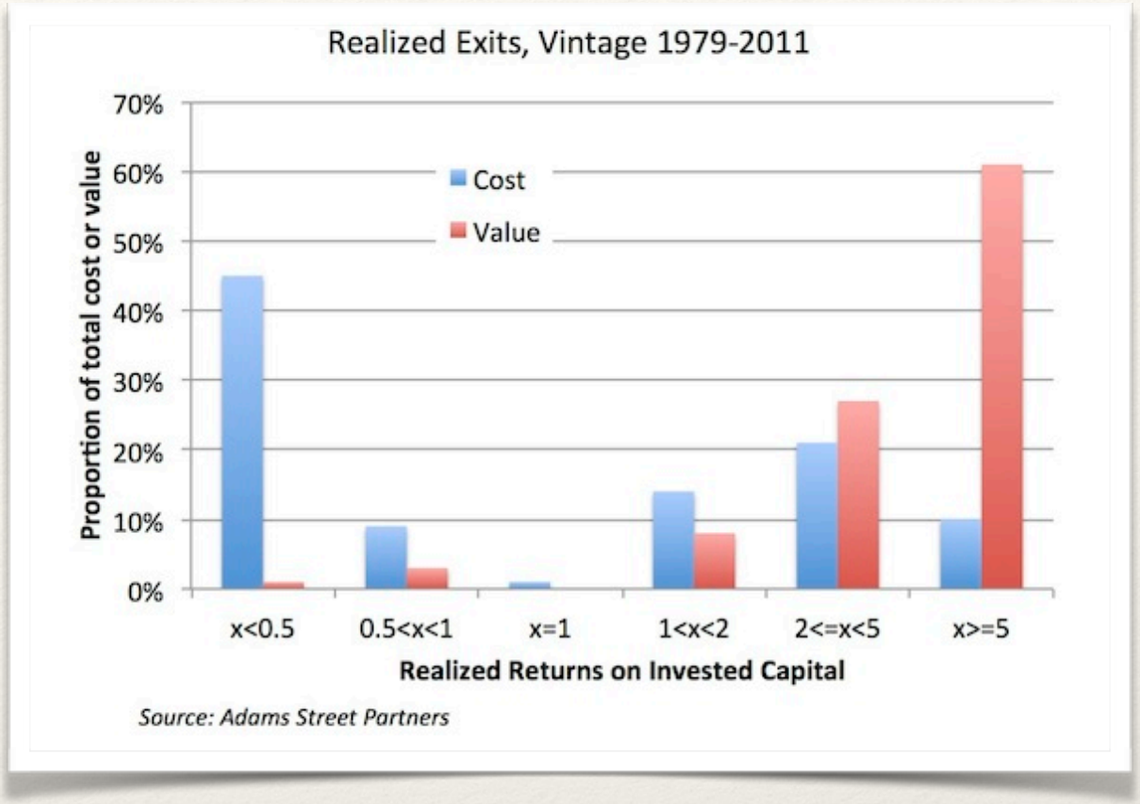
# Companies too

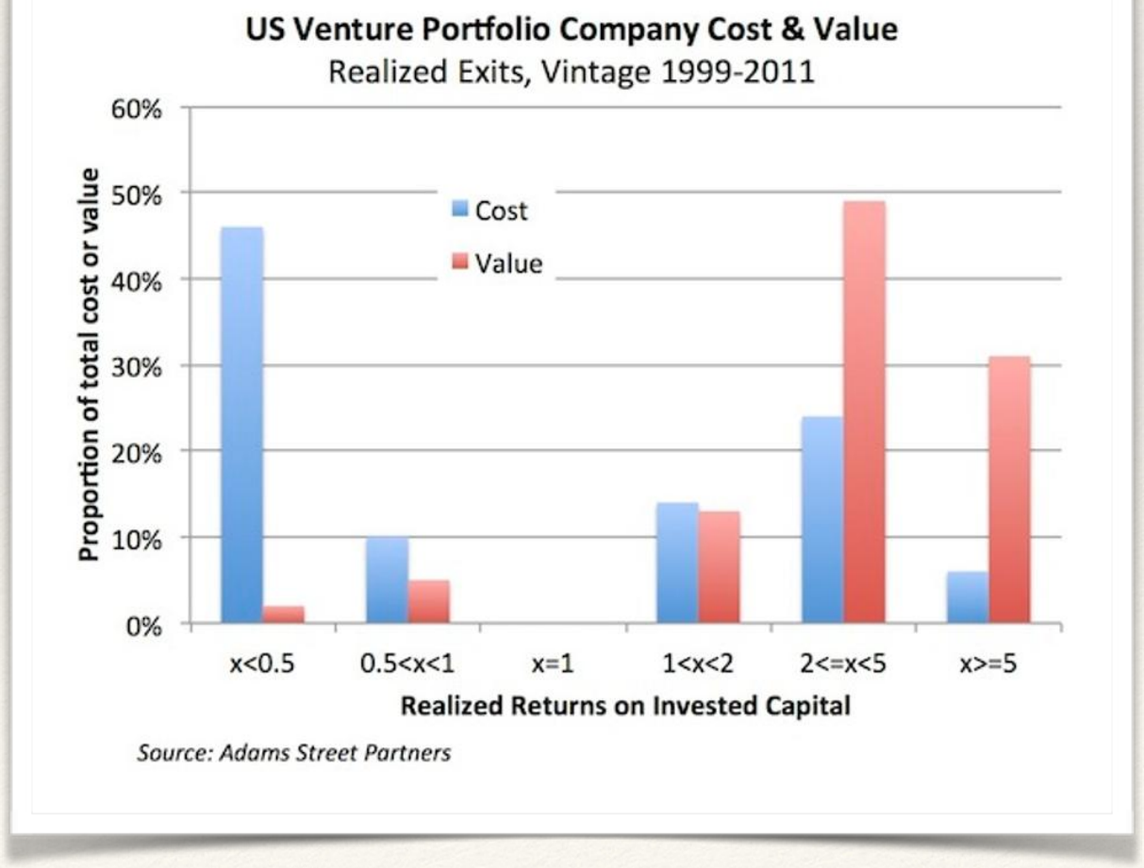
- Computerm
- Milco
- Cubitech
- Pick’n’pack
- Esprit Investments
- Smyth and Associates
- Oak Grove Consulting
- Westlawn

# Doing Hard Things

- Mars: 45% success rate
- VC Backed Companies: 25%
  - With women in charge: 61%
- Agile works!
  - A team of good people that work hard and are very committed

- VC backed companies tend to be Agile
- Note the consistent increase in value during Agile era



# Essential Teams

- Everybody knows prioritized success criteria
  - Use priorities to make tactical decisions: i.e., when is this meeting over?
- Everybody works to prioritized requirements
  - Concentrate on what is needed first
- Focus on flight artifacts
  - Documentation minimized
  - Each engineer does systems engineering: who are you interfaces, make sure you understand their needs, work those issues. No intermediaries.

# Managers

- Biggest problems with managers: MOST are BAD at:
  - Listening
  - Responding with Empathy
  - Maintaining self-esteem
  - Clarifying what others are saying
  - Developing others' ideas

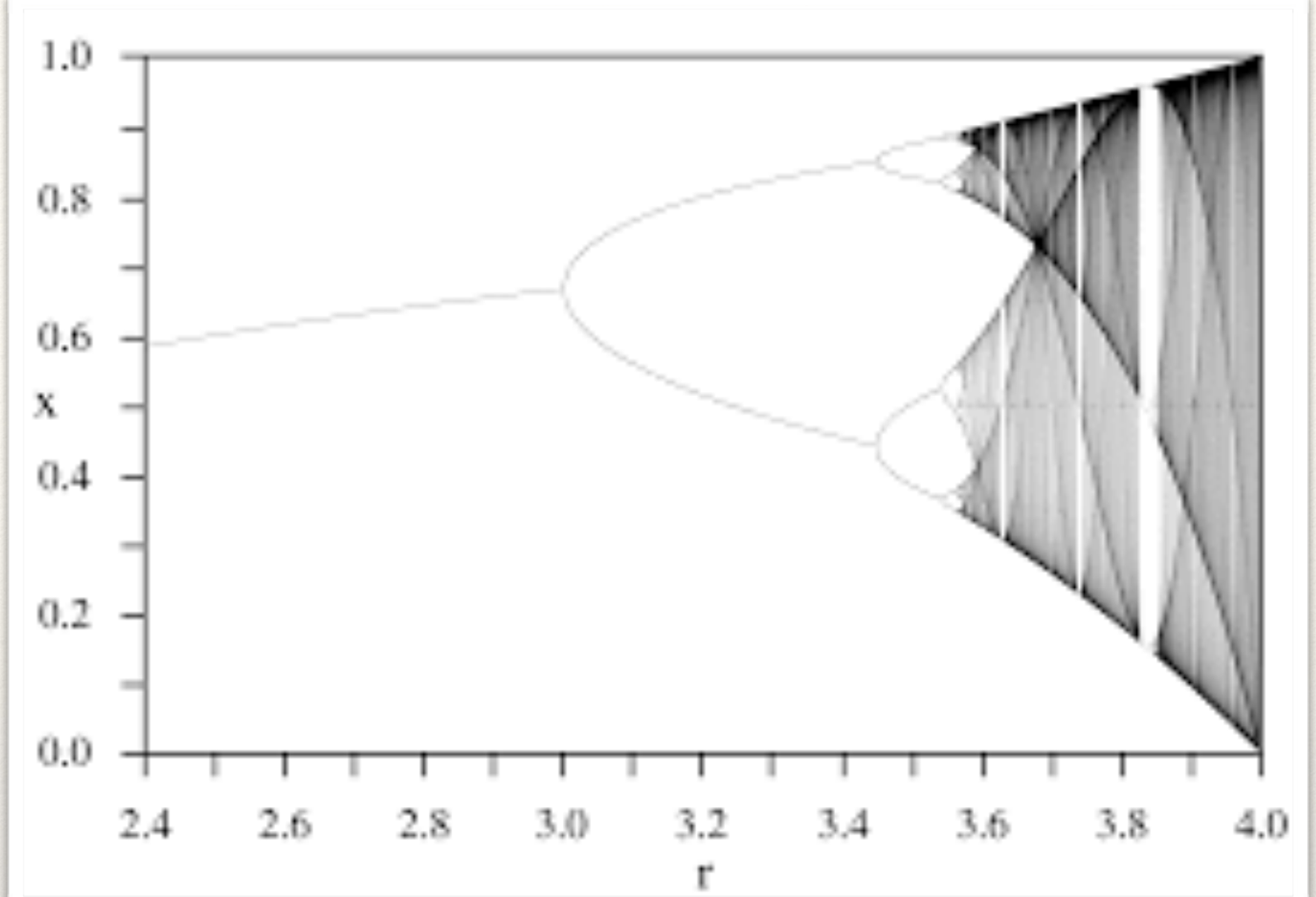

*Sailboat racing with my family*

# Play!

Science requires observation.
See what makes a difference,
and understanding emerges.


SC 27
108
67994
18243
47911
002


MOTIVE 25R




# Chaos is everywhere

$$x_{t+1} = r x_t (1 - x_t),$$