Researcher to Entrepreneur!

K.C. Byron
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Researcher to Entrepreneur!

- Introduction
- The Enterprise Cycle
- How Research and Business Progress
- Drivers of Innovation
- Entrepreneurial Skills
**Introduction to Terms**

**Creativity:** Ideas that are *original* and *useful*. A novel and appropriate response to an open-ended challenge or problem.

**Innovation:** A connected process in which many activities from research through to support are coupled together in an integrated way for a common goal.

- Imagination
- Intuition
- Ingenuity
- Insight
- Inspiration
### From Creativity to Innovation

**Who Invented the lightbulb?**

<table>
<thead>
<tr>
<th>Date</th>
<th>Inventor</th>
<th>Nationality</th>
<th>Filament</th>
<th>Atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>1802</td>
<td>Davy</td>
<td>English</td>
<td>Platinum</td>
<td>Air</td>
</tr>
<tr>
<td>1840</td>
<td>Grove</td>
<td>English</td>
<td>Platinum</td>
<td>Air</td>
</tr>
<tr>
<td>1841</td>
<td>De Moleyns</td>
<td>English</td>
<td>Platinum</td>
<td>Vacuum</td>
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<td>1845</td>
<td>Starr</td>
<td>American</td>
<td>Platinum</td>
<td>Air</td>
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<td>1846</td>
<td>Greener</td>
<td>English</td>
<td>Carbon</td>
<td>Air</td>
</tr>
<tr>
<td>1848</td>
<td>Staite</td>
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<td>Platinum</td>
<td>Air</td>
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<td>1850</td>
<td>Shepard</td>
<td>American</td>
<td>Carbon</td>
<td>Vacuum</td>
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<tr>
<td>1852</td>
<td>Roberts</td>
<td>English</td>
<td>Carbon</td>
<td>Vacuum</td>
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<tr>
<td>1856</td>
<td>de Changy</td>
<td>French</td>
<td>Platinum</td>
<td>Air</td>
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<tr>
<td>1859</td>
<td>Farmer</td>
<td>American</td>
<td>Carbon</td>
<td>Air</td>
</tr>
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<td>1860</td>
<td>Swan</td>
<td>English</td>
<td>Carbon</td>
<td>Vacuum</td>
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<td>1872</td>
<td>Lodyguine</td>
<td>Russian</td>
<td>Carbon</td>
<td>Nitrogen</td>
</tr>
<tr>
<td>1875</td>
<td>Woodward</td>
<td>Canadian</td>
<td>Carbon</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Kosloff</td>
<td>Russian</td>
<td>Carbon</td>
<td>Nitrogen</td>
</tr>
<tr>
<td></td>
<td>Kohn</td>
<td>Russian</td>
<td>Carbon</td>
<td>Vacuum</td>
</tr>
<tr>
<td>1876</td>
<td>Fontaine</td>
<td>French</td>
<td>Carbon</td>
<td>Vacuum</td>
</tr>
<tr>
<td>1877</td>
<td>Maxim</td>
<td>American</td>
<td>Platinum</td>
<td>Air</td>
</tr>
<tr>
<td>1878</td>
<td>Sawyer</td>
<td>American</td>
<td>Carbon</td>
<td>Nitrogen</td>
</tr>
<tr>
<td></td>
<td>Maxim</td>
<td>American</td>
<td>Carbon</td>
<td>Hydrocarbon</td>
</tr>
<tr>
<td></td>
<td>Lane-Fox</td>
<td>American</td>
<td>Platinum-iridium</td>
<td>Air</td>
</tr>
<tr>
<td>1879</td>
<td>Jenkins</td>
<td>American</td>
<td>Platinum</td>
<td>Nitrogen</td>
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<tr>
<td></td>
<td>Hall</td>
<td>American</td>
<td>Platinum</td>
<td>Air</td>
</tr>
<tr>
<td></td>
<td>Edison</td>
<td>American</td>
<td>Carbon</td>
<td>Vacuum</td>
</tr>
</tbody>
</table>
Serendipity or end goal?

An Entrepreneur: “Searches for change, responds to it and exploits opportunities. Innovation is a specific tool of an entrepreneur.”

“Most of what you hear about entrepreneurship is all wrong. It’s not magic, it’s not mysterious, it’s a discipline, and like any discipline, it can be learnt.”

Peter Drucker (Business Expert)
### Table 1. Incomplete list of serendipitous discoveries in drug research.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Accidental Discovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetanilide</td>
<td>tested as internal antiseptic (instead of naphthalene)</td>
</tr>
<tr>
<td>Acetylsalicylic acid</td>
<td>irreversible enzyme inhibitor (vs. salicylic acid prodrug)</td>
</tr>
<tr>
<td>Aminogluthethimide</td>
<td>breast cancer treatment (instead of antiepileptic)</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>stimulant (instead of nasal decongestant)</td>
</tr>
<tr>
<td>Chloral hydrate</td>
<td>prodrug of trichloroethanol (instead of chloroform)</td>
</tr>
<tr>
<td>Chlordiazepoxide</td>
<td>tranquillizer (unexpected chemical rearrangement)</td>
</tr>
<tr>
<td>Chlorpromazine</td>
<td>neuroleptic (tested to prevent surgical shock)</td>
</tr>
<tr>
<td>Cinnarizine</td>
<td>cardiovascular (predominant to antihistaminic) activity</td>
</tr>
<tr>
<td>Cisplatin</td>
<td>cytotoxic effect of electrolysis product</td>
</tr>
<tr>
<td>Clonidine</td>
<td>antihypertensive (instead of nasal decongestant)</td>
</tr>
<tr>
<td>Cromoglycate</td>
<td>antiallergic (accidental formation of chromone dimer)</td>
</tr>
<tr>
<td>Cyclosporin</td>
<td>immunosuppressant (instead of antifungal agent)</td>
</tr>
<tr>
<td>Dichloroisoprenaline</td>
<td>ß-blockade (instead of bronchodilation)</td>
</tr>
<tr>
<td>Dicoumarol</td>
<td>fatal cattle poisoning (bleeding) by moldy hay</td>
</tr>
<tr>
<td>Diethylstilbestrol</td>
<td>estrogenic impurity of anol (dimerization product)</td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td>allergy treatment caused prevention of travel sickness</td>
</tr>
<tr>
<td>Diphenoxylate</td>
<td>antidiarrhoeic (instead of analgesic)</td>
</tr>
</tbody>
</table>
Managerial vs Entrepreneurial Thinking

Saras Sarasvathy: University of Virginia

Managerial Thinking (Causal)

Entrepreneurial Thinking (Effectual)

Given Means

Imagined Ends
• Introduction

• The Enterprise Cycle

• How Research and Business Progress

• Drivers of Innovation

• Entrepreneurial Skills
The Enquiry Cycle

The Scientific Community

Society

Observing

Defining the Problem

Forming the Question

Investigating the Known

Articulating the Expectation

Carrying out the Study

Interpreting the Results

Reflecting on the Findings

Communicating the Findings

Questions

Harwood, W.S., Reiff, R., & Phillipson, T.
The Enterprise Cycle*

Questions & Decisions

Observing

Defining the Problem or Challenge

Transforming the Challenge with a new Business Idea

Resarching the Market

Articulating the Business Proposition

Developing the Business

Testing the Market

Reflecting on the Market response

Launching the Business

The Marketplace

More Innovation

More Creativity

* K. Byron; IEEC Conference, Cardiff, 2010.
• Introduction

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The Sigmoid (S) Curve
Maturity

Research Progress

Next Development

2 Sources:
Incubation (Creativity)
Res Management (Innovation)

Effort (Time)

Creative Steps
Delays
Setbacks

Infancy

Rapid Development

Maturity

Research Progress
Evolution of Optical Fibre Communication

1966  Kao & Hockham first propose optical fibre

First Commercial system

1975  Basic Research
1980  Field trials
1985
1990
1995
2000

Copper Cables

5 Generations of Technology

Laser in the Eye of a Needle

Optical Computing

Lab on a chip

Progress
Bit Rate (Gbit/s)
When solving lesser problems as part of a larger research project – ask:

Who Else?

Where Else?
Delays to Innovation 2

“Why didn’t I think of that?”
The Discovery of Buckminsterfullerine (Buckyballs)

Harold Kroto (University of Sussex) – Microwave spectroscopy of Carbon rich red giants

Richard Smalley (Rice University, Houston) - Research on cluster chemistry
Importance of personal history

Cyclone Dust Separator 1950

United States Patent

Dyson

- Filed: Aug. 14, 1984
- Related U.S. Application Data

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Drivers of Innovation

“We must no longer wait for tomorrow - it has to be invented” - Gaston Berger

“Tomorrow is not what it used to be“ - Paul Valery

• Relationship Marketing
• Rise of Global Competition
• Boom & Bust Cycles
• Accelerating Change
• The ‘Open’ World

<table>
<thead>
<tr>
<th>Innovation Period (Years)</th>
<th>Diffusion Period (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>6-32</td>
</tr>
<tr>
<td>2010</td>
<td>1-5</td>
</tr>
</tbody>
</table>
Opportunities for Innovation

• Demographics

• Lifestyle

• New Knowledge
• Introduction
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### The Skills and Specialist Knowledge associated with Entrepreneurship

<table>
<thead>
<tr>
<th>Specialised Knowledge and ‘Technical Skills’</th>
<th>Transferable Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Research</td>
<td>Creativity/Critical Thinking</td>
</tr>
<tr>
<td>IPR &amp; Confidentiality</td>
<td>Personal Effectiveness</td>
</tr>
<tr>
<td>Business Model Innovation</td>
<td>Influence</td>
</tr>
<tr>
<td>Business Plan Preparation</td>
<td>Communication</td>
</tr>
<tr>
<td>Finance</td>
<td>Negotiation</td>
</tr>
<tr>
<td>Setting up a Business</td>
<td>Management/Leadership</td>
</tr>
<tr>
<td>Marketing and Sales</td>
<td>Team Working</td>
</tr>
<tr>
<td>Project Management</td>
<td>Networking</td>
</tr>
<tr>
<td>Distribution</td>
<td>Customer Awareness</td>
</tr>
<tr>
<td>Exit Strategy</td>
<td></td>
</tr>
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“People don’t always remember what you say, but they always remember how you make them feel.”

The Key to Influence
Simon Sinek: ‘Start with Why?’

People don’t buy what you do, they buy why you do it. -Simon Sinek

What inspires the Listener (eg in Public Engagement and entrepreneurial pitches)

Why?

How?

What?

How people usually describe themselves

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How?

What?

How people usually describe themselves

What inspires the Listener (eg in Public Engagement and entrepreneurial pitches)

“People don’t always remember what you say, but they always remember how you make them feel.”
Better Brainstorming!

- Drive Arousal
- Self-Attention
- Social Anxiety
- Production Blocking
- Social Loafing
- The Sucker Effect
- Shared Common Knowledge
- Gender
- Culture Differences

Productivity Gap
- Skilled Facilitator
- Regular Breaks
- Guidelines
- Brain-writing
- Idea-Generation Tools

Number and Quality of Ideas

Nominal Group

Brainstorm Group
Idea- Generation - Transformation

- Ask “What if?”

  • Substitute
  • Combine
  • Adapt
  • Modify
    (Magnify/Minify/Multiply)
  • Put to other uses
  • Eliminate
  • Reverse
The “Eureka!” Enigma
ENTRE: Creative Problem Solving

Statements that describe the future vision of challenges/problems. 
*Tools*: Diagnosing, Abstracting

Idea-finding Tools
- Association
- Transformation
- Combination
- Analogy

How is acceptance gained? What needs to be done? What resources are required?

ENquire
- Identify & Clarify the Challenge

Transform
- Find Ideas & Evaluate
  1. Identify Criteria to evaluate Ideas
  2. Evaluate best Ideas by testing against criteria

REalise
- Plan for Action
  - What needs to be Done?
  - How? & When?

One clear statement that gets to the heart of a selected challenge
Innovation and the Customer Experience

2. New Business Challenges and Idea-generation
3. New Product/Service Concepts (Selected Ideas) IPR protection
4. Concept Screening (Commercial and technical feasibility, compatibility with company objectives and brand)
5. Selected Product/Service Development /Prototyping
7. Commercialisation (Marketing ,Distribution Sales etc)
8. Customer Added Value (Improved Experience)
Concluding Remarks

• Entrepreneurial Behaviour!!

“Most of what you hear about entrepreneurship is all wrong. It’s not magic, it’s not mysterious, it’s a discipline, and like any discipline, it can be learnt.”

Peter Drucker (Business Expert)

“Inspiration is like fresh fruit or milk: It has an expiration date. If you want to do something, you’ve got to do it now. You can’t put it on a shelf and wait two months to get around to it. You can’t just say you’ll do it later. Later, you won’t be pumped up about it anymore.”

–Jason Fried and David Heinemeier-Hansson, Rework