The Future of Veterinary Medical Education

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Chief Executive Officer

International Conference on Veterinary Eligibility and Education

Tokyo

November 21, 2018

AAVMC
Association of American
Veterinary Medical Colleges

49 Veterinary Medical Colleges

- 30 in the United States
- 5 in Canada
- 6 in Europe
- 5 in Australia and New Zealand
- 3 in Mexico and the Caribbean

25 Affiliate Members

- 14 Departments of Veterinary Science and Comparative Medicine
- 11 Colleges of Veterinary Medicine not accredited by COE

- University of Tokyo, Japan
- Seoul National University, Korea
- City University of Hong Kong
- Ripah International University, Pakistan
- University of Lahore, Pakistan
- United Arab Emirates University

Veterinary Schools and Colleges
Departments of Veterinary Science
Departments of Comparative Medicine
Other Veterinary Medical Institutions
Affiliate Veterinary Schools and Colleges

ASIA & AUSTRALIA

Mission Statement

AAVMC promotes and protects the health of people, animals and the environment by advancing veterinary medical education and providing new generations of veterinarians with the scientific knowledge and skills to meet the evolving needs of a changing world

Education

Providing quality care for people and animals in a rapidly changing world demands educational excellence

Research

Veterinary medicine plays an essential role in basic and applied research that advances animal and human health
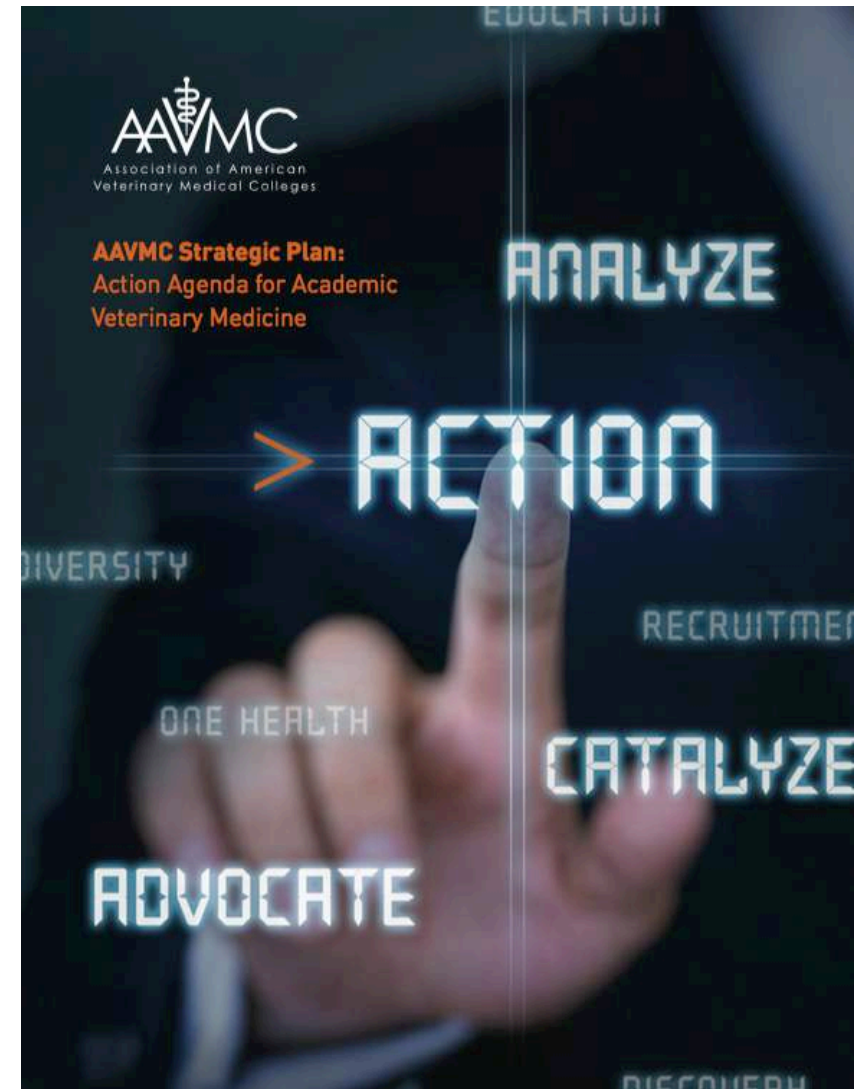
Recruitment

Veterinary medicine requires the best and brightest students from many different backgrounds

Diversity

Achieving greater diversity and raising awareness of diversity-related issues improves quality of care

One Health

Creating synergy among animal health, human health and the environment to address Global Grand Challenges

Providing quality care for people and animals in a rapidly changing world demands educational excellence

- Facilitate instructional excellence
  - Veterinary Educators Collaborative (VEC)
  - Primary Care Veterinary Educators (PCVE)
- Train today's veterinarians for tomorrow's challenges
  - Competency Based Veterinary Education (CBVE)
  - Entrustable Professional Activities (EPA)
- Foster international engagement
  - Council on International Veterinary Medical Education (CIVME)

The Social Contract
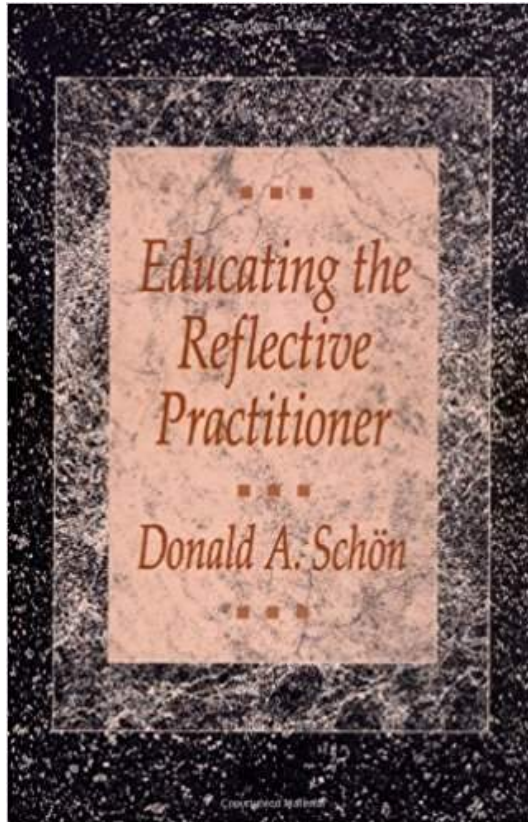
In return for access to their extraordinary knowledge in matters of great human importance, society has granted professionals a mandate for control in their fields of specialization, a high degree of autonomy in their practice, and a license to determine who shall assume the mantle of professional authority

Donald Schon, *Educating the Reflective Practitioner* (1987)

The Social Contract

The public has granted us extraordinary and exclusive dispensation to administer drugs to people, even to the point of unconsciousness, to cut them open, to do what would otherwise be considered assault, because we do so on their behalf – to save their lives and provide them comfort.

Atul Gawande, *Better* (2007

The Future of the Professions

- Expertise (specialized knowledge) is the most important characteristic of the professions

- Knowledge is now widely accessible and is becoming democratized

- Technology will change the way the public gets access to professional expertise

Increasingly capable systems
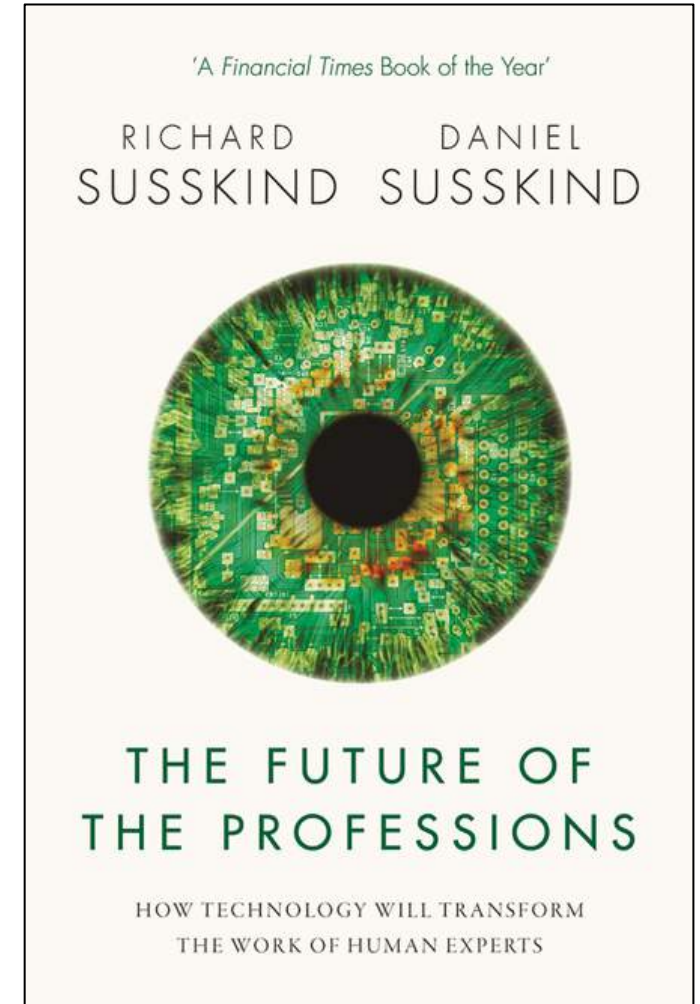
'A Financial Times Book of the Year'

RICHARD   DANIEL
SUSSKIND SUSSKIND

THE FUTURE OF
THE PROFESSIONS

HOW TECHNOLOGY WILL TRANSFORM
THE WORK OF HUMAN EXPERTS

The Role of Technology

- Exponential increase in technologies like computers, genetics, nanotechnology, robotics, and artificial intelligence

- Technological singularity in the year 2045, a point where progress is so rapid it outstrips humans' ability to comprehend it

Law of Accelerating Returns
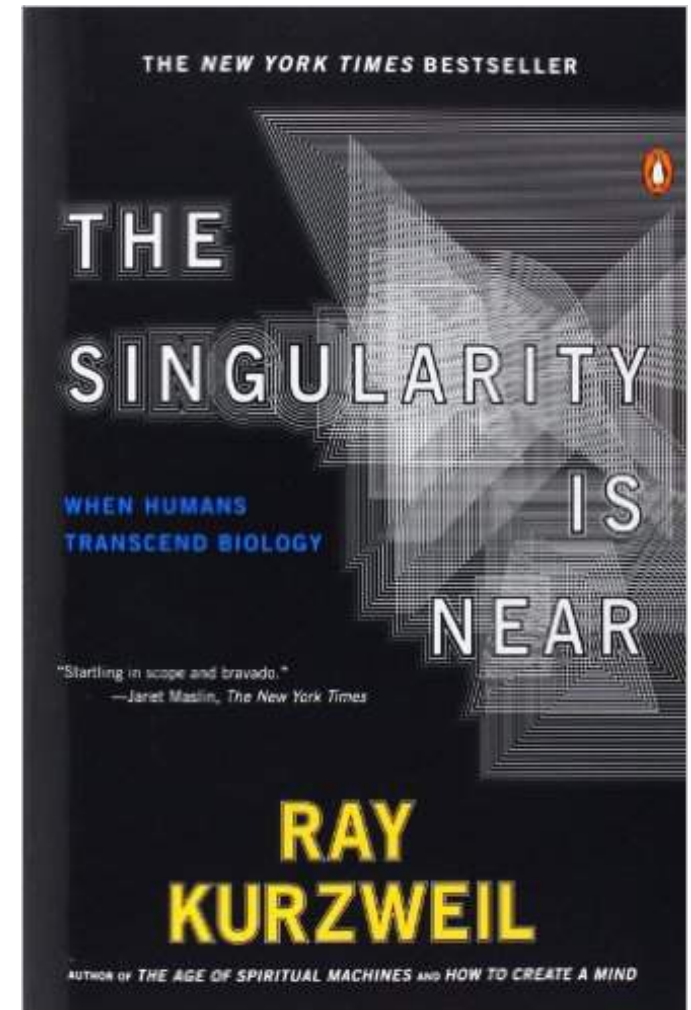
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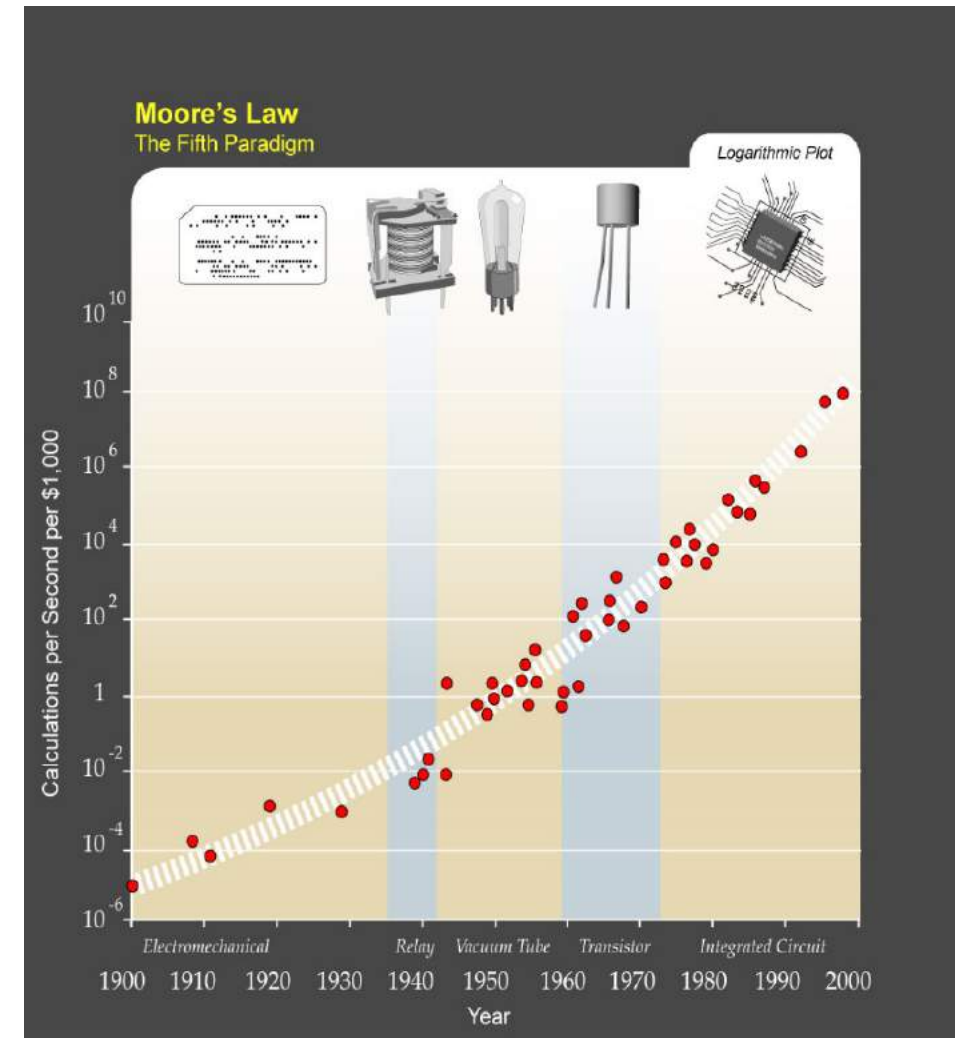
Law of Accelerating Returns

① The accelerating pace of change ...

Agricultural Revolution	← 8,000 years →	Industrial Revolution	← 120 years →	Light-bulb	← 90 years →	Moon landing	← 22 years →	World Wide Web	← 9 years →	Human genome sequenced

2045
Surpasses brainpower equivalent to that of all human brains combined

10^{26}

② ... and exponential growth in computing power ...

Computer technology, shown here climbing dramatically by powers of 10, is now progressing more each hour than it did in its entire first 90 years

10^{20}

Surpasses brainpower of human in 2023

③ ... will lead to the Singularity

10^{15}

Surpasses brainpower of mouse in 2015

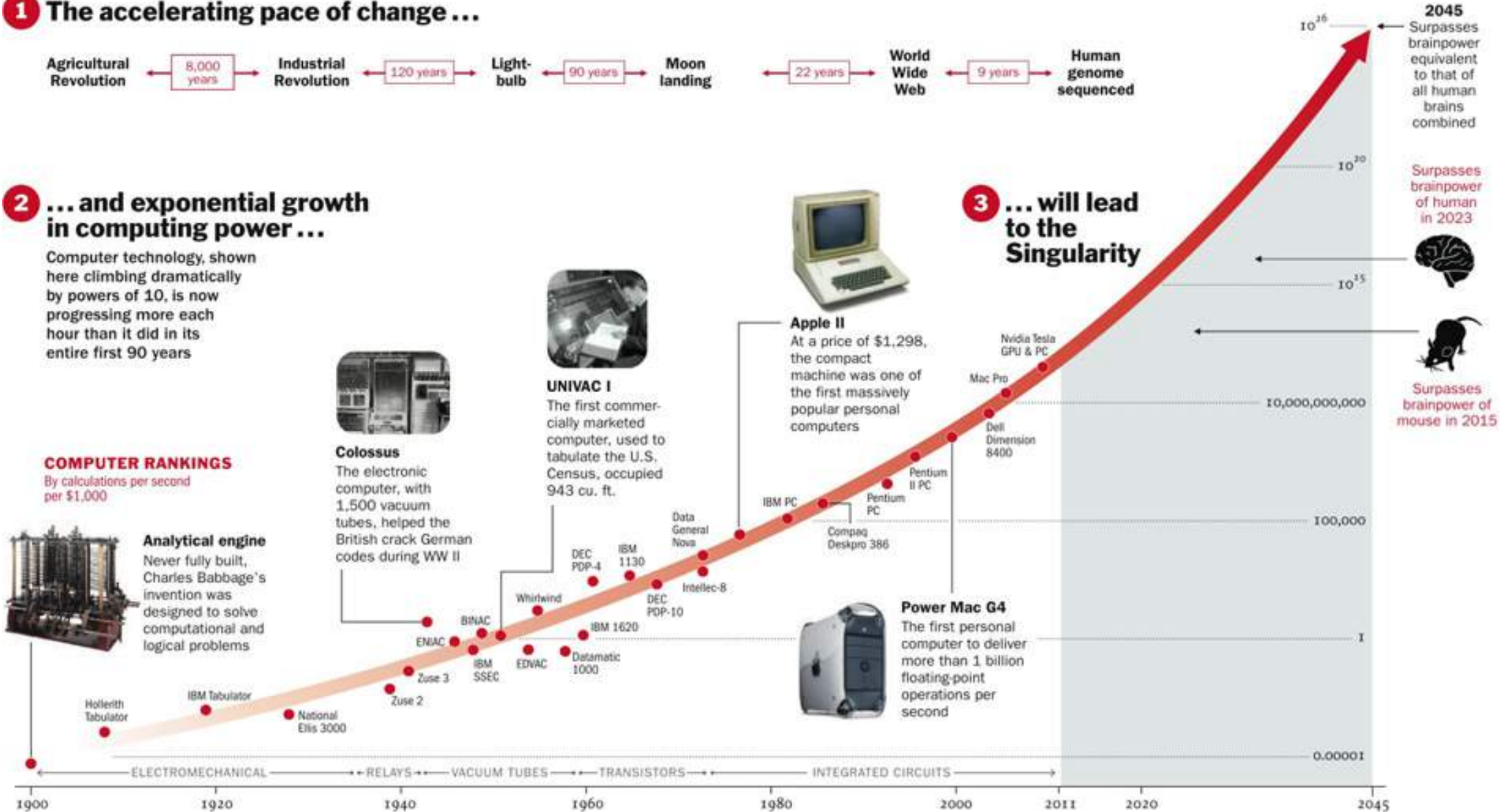**COMPUTER RANKINGS**
By calculations per second per $1,000

Apple II
At a price of $1,298, the compact machine was one of the first massively popular personal computers

Nvidia Tesla GPU & PC

Mac Pro

10,000,000,000

Colossus
The electronic computer, with 1,500 vacuum tubes, helped the British crack German codes during WW II

UNIVAC I
The first commercially marketed computer, used to tabulate the U.S. Census, occupied 943 cu. ft.
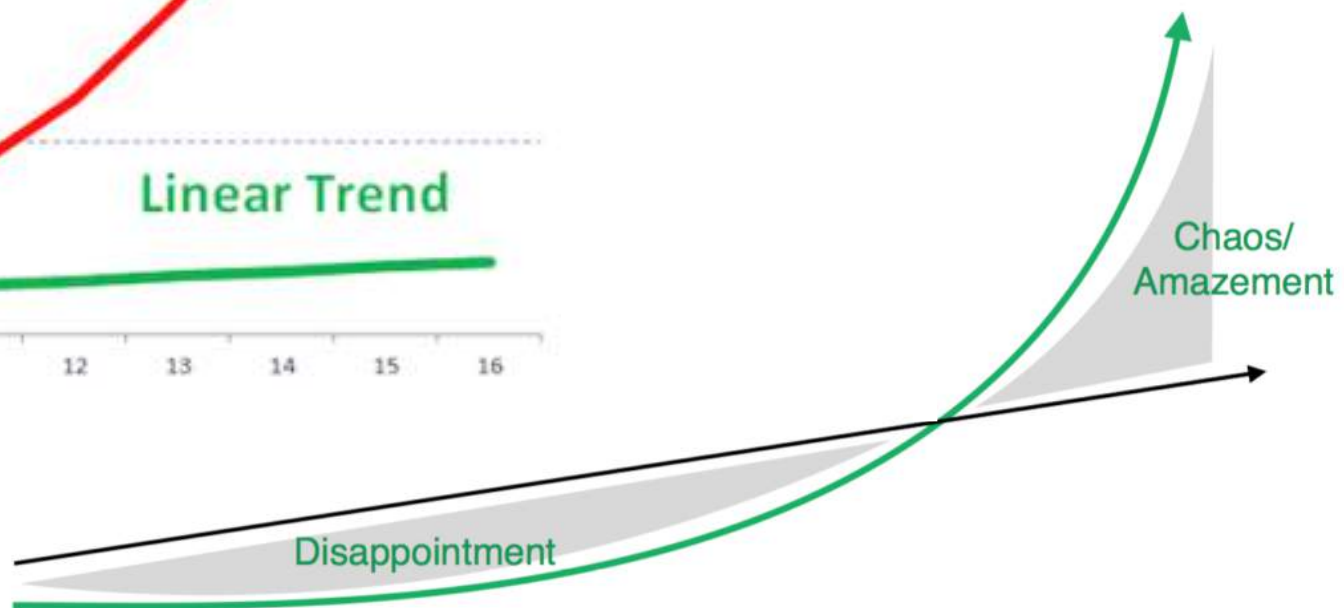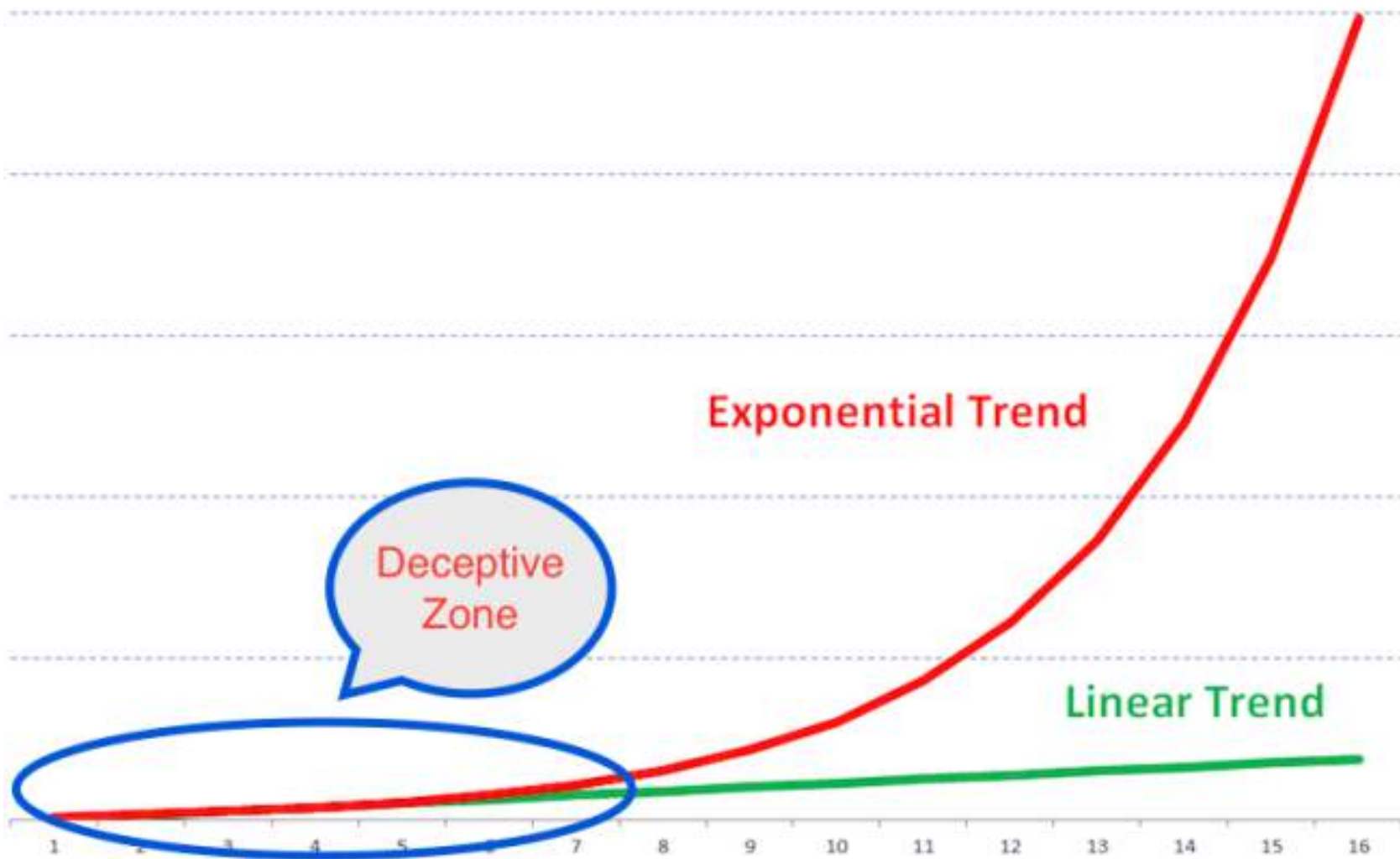
Dell Dimension 8400

Analytical engine
Never fully built, Charles Babbage's invention was designed to solve computational and logical problems

Data General Nova

IBM PC

Pentium II PC

Pentium PC

100,000

Compaq Deskpro 386

DEC PDP-4

IBM 1130

Whirlwind

BINAC

ENIAC

DEC PDP-10

Intelec-8

IBM 1620

IBM SSEC

EDVAC

Datamatic 1000

Power Mac G4
The first personal computer to deliver more than 1 billion floating-point operations per second

1

Zuse 3

IBM Tabulator

Zuse 2

0.00001

Hollerith Tabulator

National Ellis 3000

ELECTROMECHANICAL ————→ ←RELAYS→ ←—VACUUM TUBES —→ ← TRANSISTORS —→ ← ———— INTEGRATED CIRCUITS ————→

| 1900 | 1920 | 1940 | 1960 | 1980 | 2000 | 2011 | 2020 | 2045 |

The Future of Healthcare

Telehealth & Telemedicine in Veterinary Practice

Telehealth has arisen as one of the greatest opportunities and challenges facing medicine in this digital age. Using telemedicine in the delivery of veterinary medical services offers benefits for animal owners, patients and the profession. However, veterinary services must be provided with professionalism and adhering to the same standard of care, whether delivered in person or through electronic means.

The AVMA is committed to ensuring access to the convenience and benefits afforded by telemedicine, while promoting the responsible provision of high-quality veterinary medical care.

Telehealth Basics

What is telehealth? How is it different from telemedicine? Know these and other definitions, and get answers to frequently asked questions about all aspects of veterinary telehealth.

Telehealth and the VCPR

Delivery of veterinary medical care requires the existence of a Veterinarian-Client-Patient Relationship (VCPR). Learn what compliance with the VCPR requirement looks like in the context of telehealth.

Steps to Implement Telemedicine

When deployed properly to support communication and care coordination, telemedicine may improve patient triage and clinical outcomes, and benefit patients, animal owners, and the veterinary practice. Follow these steps to implement telemedicine programs successfully in your practice.

Service Models for Veterinary Telemedicine

Telemedicine is not a one-size-fits-all proposition. You can customize your program and services to fit the needs of your veterinary patients, clients and practice. Here, we outline and compare a variety of existing service models.

Case Study

Learn from your colleagues' experience. Here's how one veterinary team increased client compliance with post-surgical and hospice care recommendations by augmenting in-hospital care with telemedicine services.

The Future of Healthcare
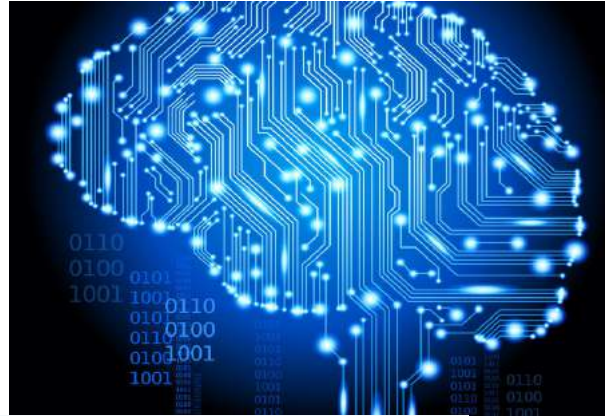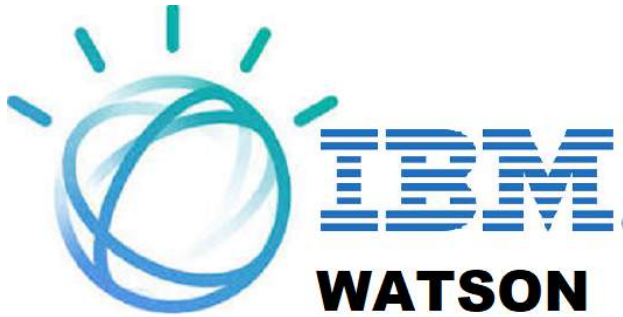
IBM Watson for Genomics

Bringing the promise of precision medicine to more cancer patients, Watson can interpret genetic testing results faster and with greater accuracy than manual efforts. Our partnership with Quest Diagnostics means that all providers can potentially benefit, regardless of access to in-house sequencing.

IBM Watson for Oncology

Spend less time searching literature and more time caring for patients. Watson can provide clinicians with evidence-based treatment options based on expert training by Memorial Sloan Kettering (MSK) physicians.

THE NEW YORKER

ANNALS OF MEDICINE APRIL 3, 2017 ISSUE

A.I. VERSUS M.D.

What happens when diagnosis is automated?

By Siddhartha Mukherjee

The Future of Healthcare

Yomi® provides an unprecedented level of precision and control. Using haptic guidance and multisensory feedback, Yomi® helps you achieve the right location, angulation and depth to place the implant perfectly.

A robot implants 3D-printed teeth in a Chinese patient

A new age of autonomous robotic surgery is on the way, at least for some routine procedures

By Greg Nichols for Robotics | September 25, 2017 -- 09:25 GMT (02:25 PDT) | Topic: Robotics

The da Vinci Surgical System

The Future of Companionship

About

Markets ∨   Topics ∨   Resources

EXECUTIVE BRIEFING 01/30/2018 11:00 pm ET

Is Loneliness The Overlooked Social Determinant?

By Sarah C. Threnhauser, MPA

The contribution of animals to human welfare
Scientific and Technical Review, Vol. 37 (1)

Temple Grandin, ed., 2018

Social Determinants of Health

- Neighborhood and Built Environment
- Economic Stability
- Health and Health Care
- SDOH
- Education
- Social and Community Context

habri
human animal bond research institute

WE ARE THE HUMAN ANIMAL BOND RESEARCH INSTITUTE

HABRI believes in the powerful relationship between animals and people and the impact of this relationship on the health of individuals, families, and communities.

The Future of Food

GROWING FOOD WHERE THE PEOPLE ARE

Urban Agriculture

Moving food production from rural to urban areas reduces transportation costs, and allows fresher food to be delivered to the growing global urban population.

9.9%

17%

In 2015 alone, some 9.9% of the world's population engaged in some level of urban agriculture, producing about 17% of the world's food.

Most of this activity, is small scale and often sustenance farming. This is changing as technology is allowing for more compact agricultural infrastructure.
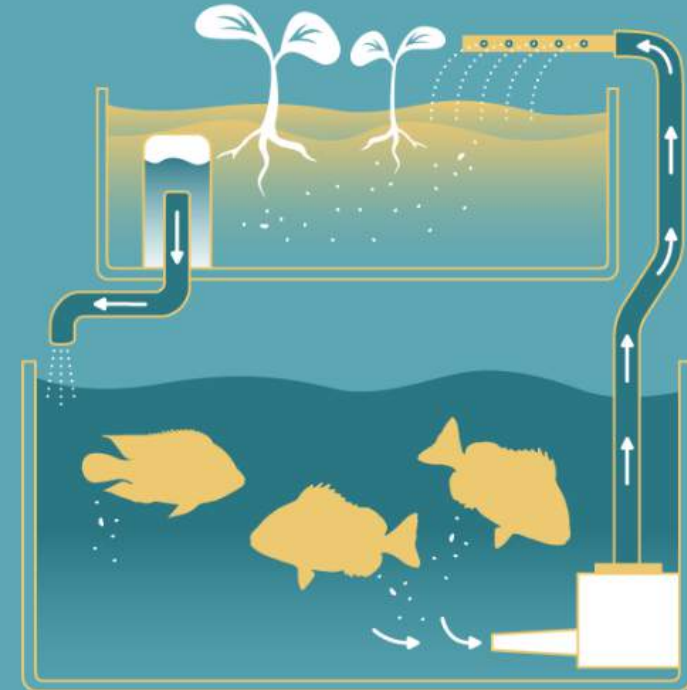
Aquaponics

Integration of fish farming (aquaculture) and soil-free agriculture (hydroponics) is a relatively new agricultural technology.

Fish convert their food into nutrients the plants can absorb, while the plants clean the water for the fish.

These systems take upwards of 18 months to 'age' as microbial colonies grow in the pipes, hydroponic media, and fish tank. They are the backbone of the system, making nutrients available to the plants and ensuring the water is filtered for the fish.

This uses water at almost half the rate as conventional farming while raising a significant amount of fish.

The Future of Food

HOW THE BURGERS ARE GROWN

1. Tissue is taken from cow
2. Stem cells are extracted from the tissue
3. Stem cells are then grown into muscle fibres in the lab in six weeks
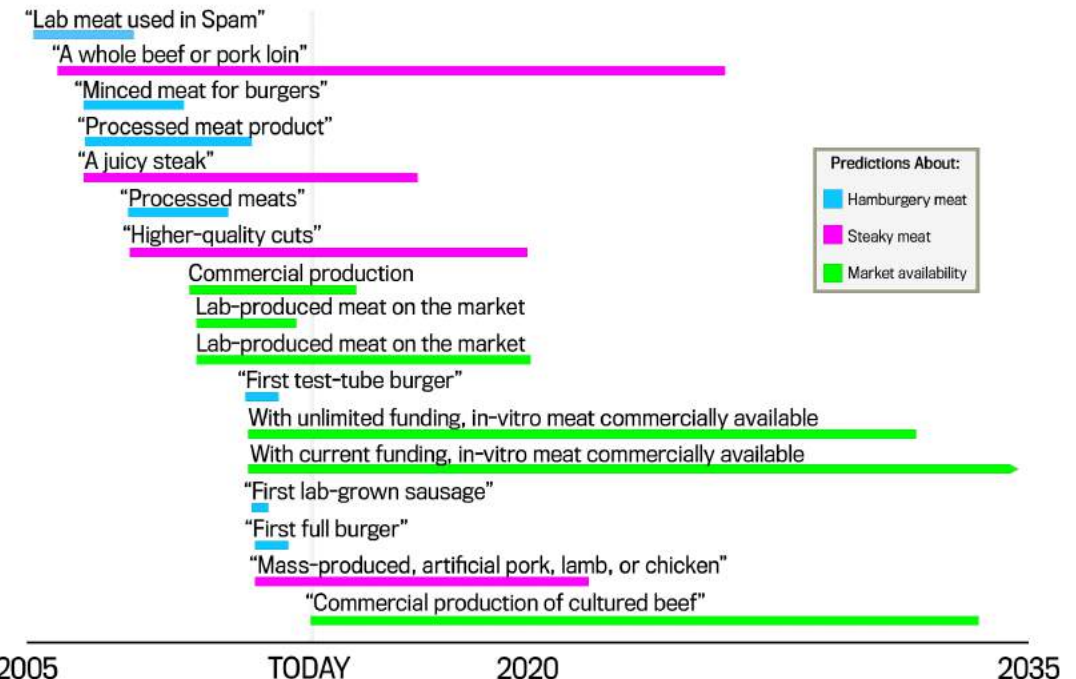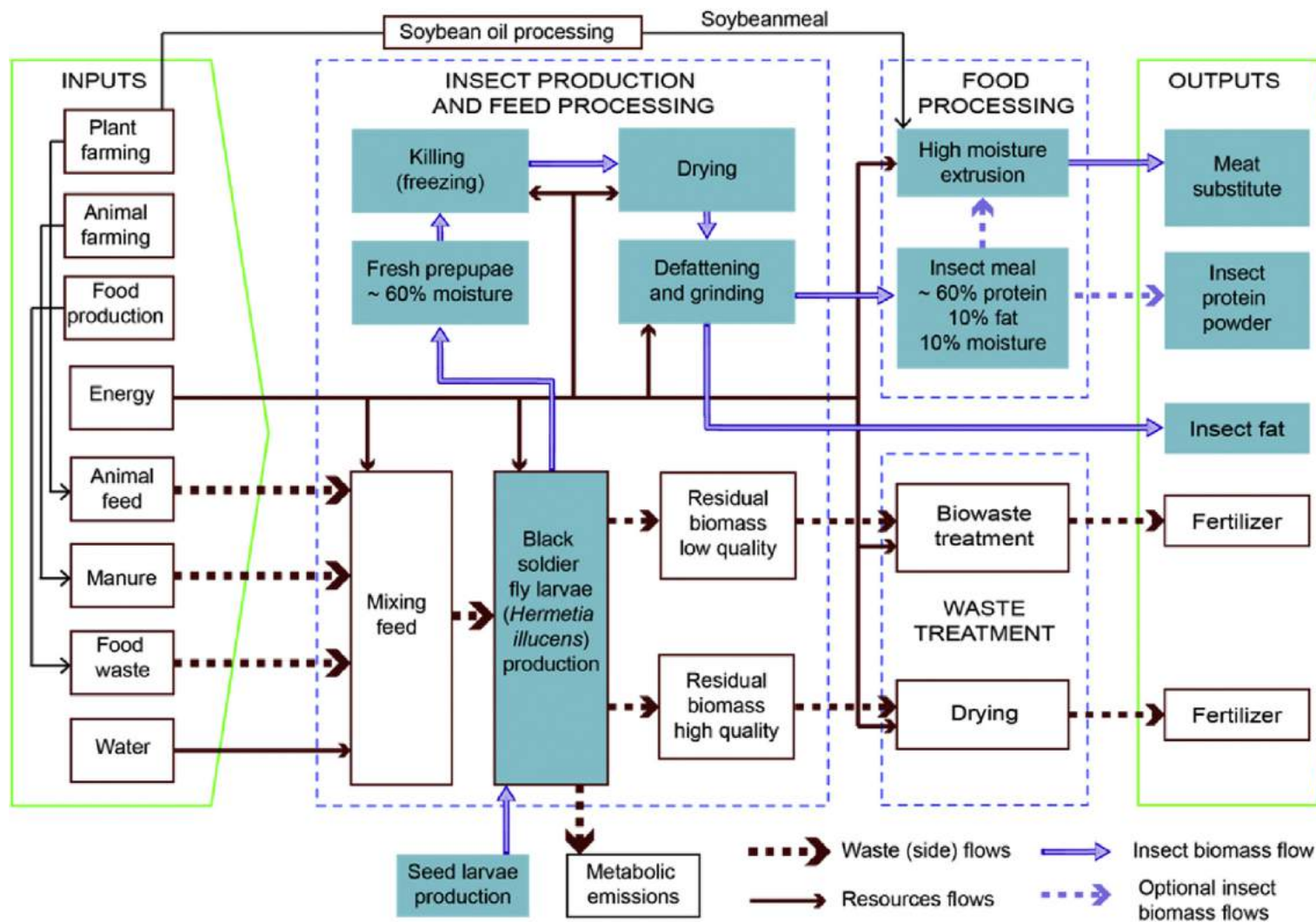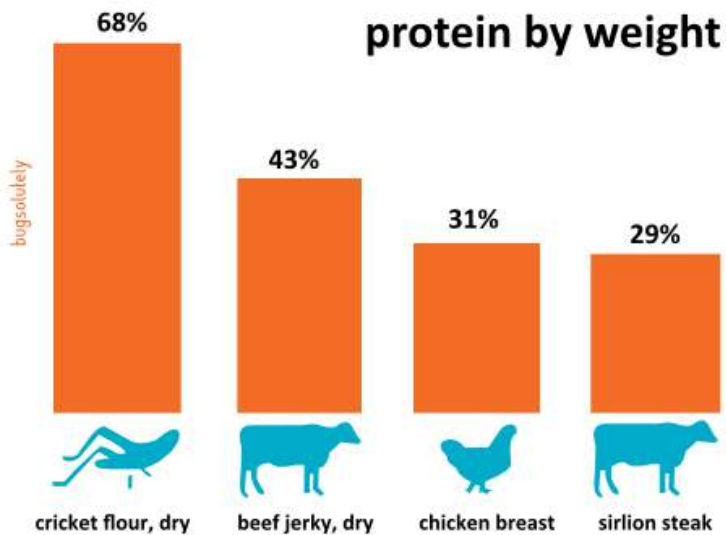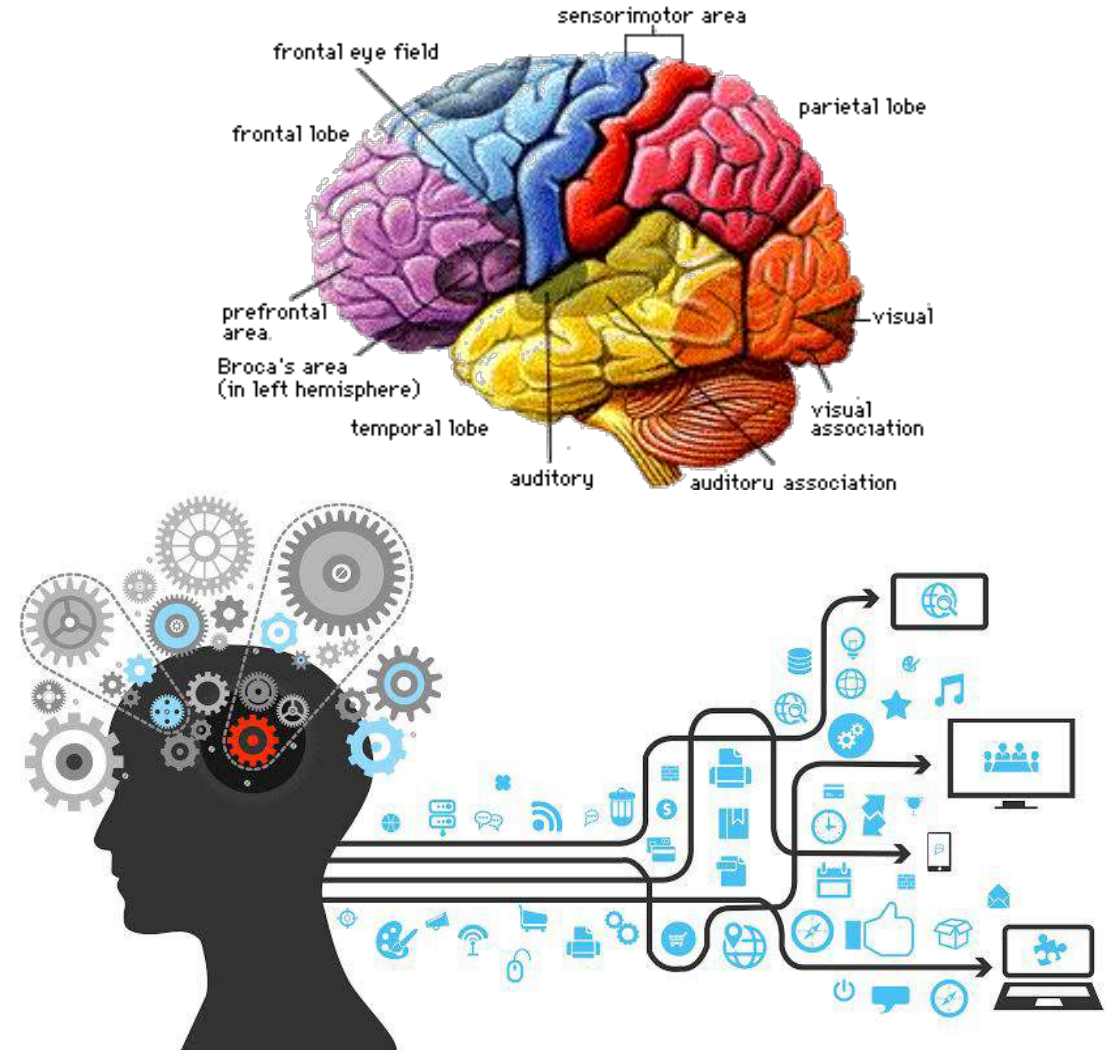4. 20,000 muscle fibres are then coloured, minced, mixed with fats and shaped into burgers

Environmental issues → Decrease in meat consumption
Animal welfare concerns → Decrease in meat consumption
Human health concerns → Decrease in meat consumption

Pleasure to eat meat → High value of meat
Good for health → High value of meat
Symbol of force → High value of meat

Urbanization → Decrease in meat knowledge
Less knowledge in agriculture → Decrease in meat knowledge
Less contact with farm animals → Decrease in meat knowledge
Development of the hamburger → Decrease in meat knowledge

Trust in science

Acceptance of artificial meat

Unnaturalness of the product
Expensive price
Concerns about human health
Concerns about sensory traits
Uncertain ability to solve environmental issues
Researchers = apprentice sorcerers

In-Vitro Meat Predictions 2005-2035

"Lab meat used in Spam"
"A whole beef or pork loin"
"Minced meat for burgers"
"Processed meat product"
"A juicy steak"
"Processed meats"
"Higher-quality cuts"
Commercial production
Lab-produced meat on the market
Lab-produced meat on the market
"First test-tube burger"
With unlimited funding, in-vitro meat commercially available
With current funding, in-vitro meat commercially available
"First lab-grown sausage"
"First full burger"
"Mass-produced, artificial pork, lamb, or chicken"
"Commercial production of cultured beef"

Predictions About:
- Hamburgery meat
- Steaky meat
- Market availability

2005   TODAY   2020   2035

The Future of Food

EDIBLE INSECTS :
A SOLUTION FOR FOOD AND FEED SECURITY?

Acheta Domestica

CRICKET FLOUR

protein by weight

68% cricket flour, dry
43% beef jerky, dry
31% chicken breast
29% sirlion steak

bugsolutely

Soybean oil processing — Soybeanmeal

INPUTS
- Plant farming
- Animal farming
- Food production
- Energy
- Animal feed
- Manure
- Food waste
- Water

INSECT PRODUCTION AND FEED PROCESSING
- Killing (freezing)
- Drying
- Fresh prepupae ~ 60% moisture
- Defattening and grinding
- Mixing feed
- Black soldier fly larvae (*Hermetia illucens*) production
- Residual biomass low quality
- Residual biomass high quality
- Seed larvae production
- Metabolic emissions

FOOD PROCESSING
- High moisture extrusion
- Insect meal ~ 60% protein 10% fat 10% moisture

WASTE TREATMENT
- Biowaste treatment
- Drying

OUTPUTS
- Meat substitute
- Insect protein powder
- Insect fat
- Fertilizer
- Fertilizer

Waste (side) flows · Insect biomass flow · Resources flows · Optional insect biomass flows

The Future of Teaching and Learning

Uniquely Individual
- Abstract thought
- Active learning
- Higher order cognition

Personalized Teaching
- Customized
- Instant feedback
- Self-paced
- Adaptive

The Future of Higher Education

Higher education is ripe for disruptive innovation

- Not much has changed in 150 years
- Inefficient and conflicted
- Education is disfavored
- Innovation is stifled
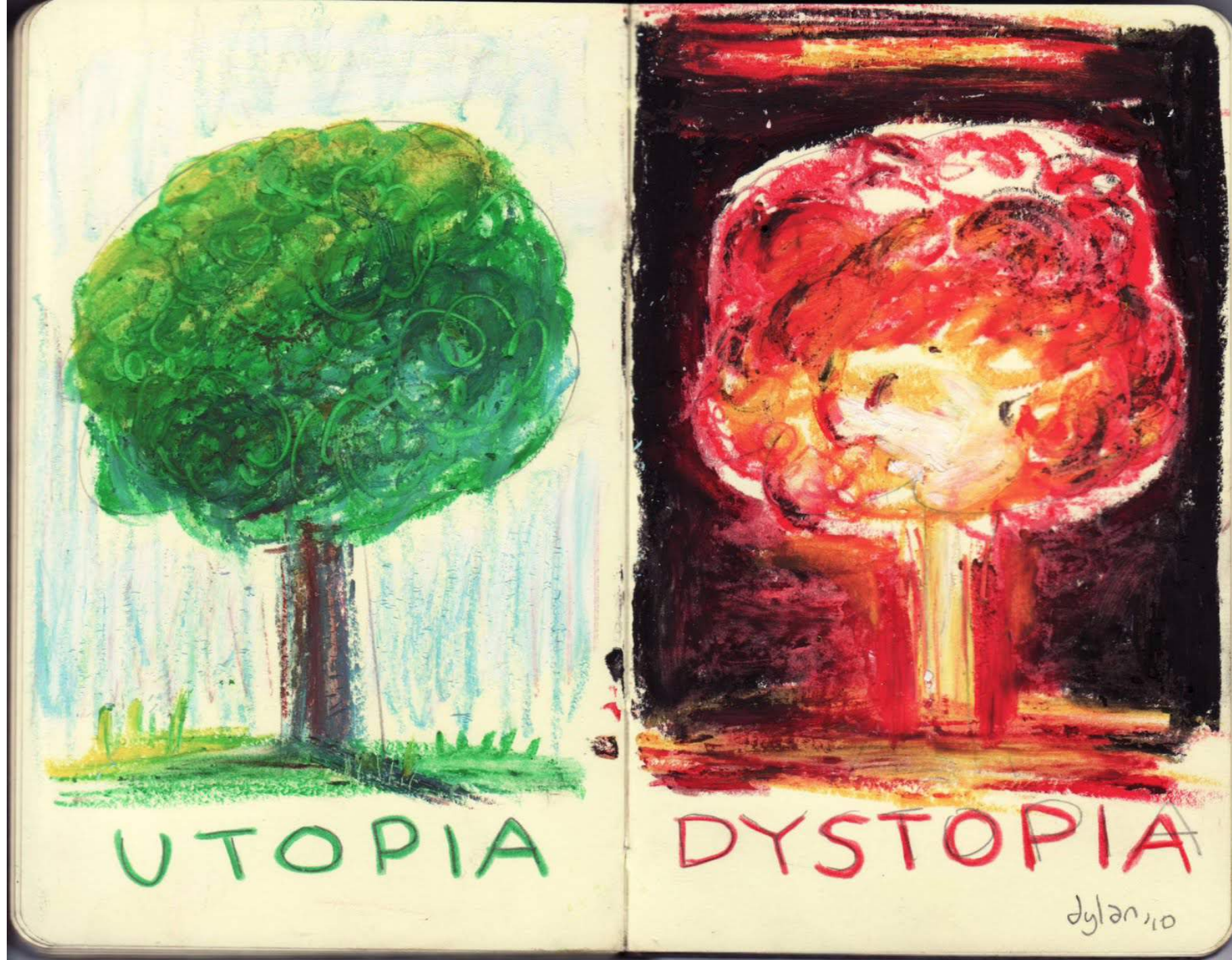
Institutional isomorphism

The Future of Higher Education

What technological advancements have changed the nature of education?

Is this the end of veterinary school as we know it?

Or is this an opportunity to reimagine veterinary medical education?

UTOPIA

DYSTOPIA

dylan,10

The Future of Veterinary Medical Education

Competency based

Time variable

Open Loop

"Humanics"

Diversity

"The intended output of a competency-based program is a health professional who can practice medicine at a defined level of proficiency, in accord with local conditions, with local needs"

- McGahie, W. C., *et al* (1978)

"Competency-based education is an approach to preparing professionals for practice that is fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs.

- Frank, J.R., *et al* (2010)

"The intended output of a competency-based program is a health profe... cy, in acco...

...t al (1978)

"Com...als for pract... and orga... and patie...

...t al (2010)

Focus on outcomes, emphasize abilities

Shift from time-based training to competency-based assessment

Shift from faculty-centered teaching to student-centered learning

~~Outcomes assessment measures that address the college mission must be developed and implemented. Outcomes assessment results must be used to improve the college programs.~~

~~Approved June 2002~~

Outcomes of the DVM program must be measured, analyzed, and considered to improve the program. Student achievement during the pre-clinical and clinical curriculum and after graduation must be included in outcome assessment.

Veterinary graduates must have the basic scientific knowledge, skills, and values to provide entry-level health care, independently, at the time of graduation. At a minimum, graduates must be competent in providing entry-level health care for a variety of animal species.

Approved September 2011

1. Comprehensive patient diagnosis (problem solving skills), appropriate use of diagnostic testing, and record management

2. Comprehensive treatment planning including patient referral when indicated

3. Anesthesia and pain management, patient welfare

4. Basic surgery skills and case management

5. Basic medicine skills and case management

6. Emergency and intensive care case management

7. Understanding of health promotion and biosecurity, prevention and control of disease including zoonoses and principles of food safety

8. Client communications and ethical conduct

9. Critical analysis of new information and research findings relevant to veterinary medicine.

NAVMEC (2011)

1. Multispecies knowledge plus clinical competency in one or more species or disciplines

2. One Health knowledge (animal, human and environmental health)

3. Communication

4. Collaboration

5. Management (self, team, system)

6. Lifelong learning, scholarship, value of research

7. Leadership

8. Diversity and multicultural awareness

9. Adapt to changing environments

Roadmap for Veterinary Medical Education in the 21st Century:
Responsive, Collaborative, Flexible

NAVMEC REPORT AND RECOMMENDATIONS

NAVMEC
North American Veterinary
Medical Education Consortium
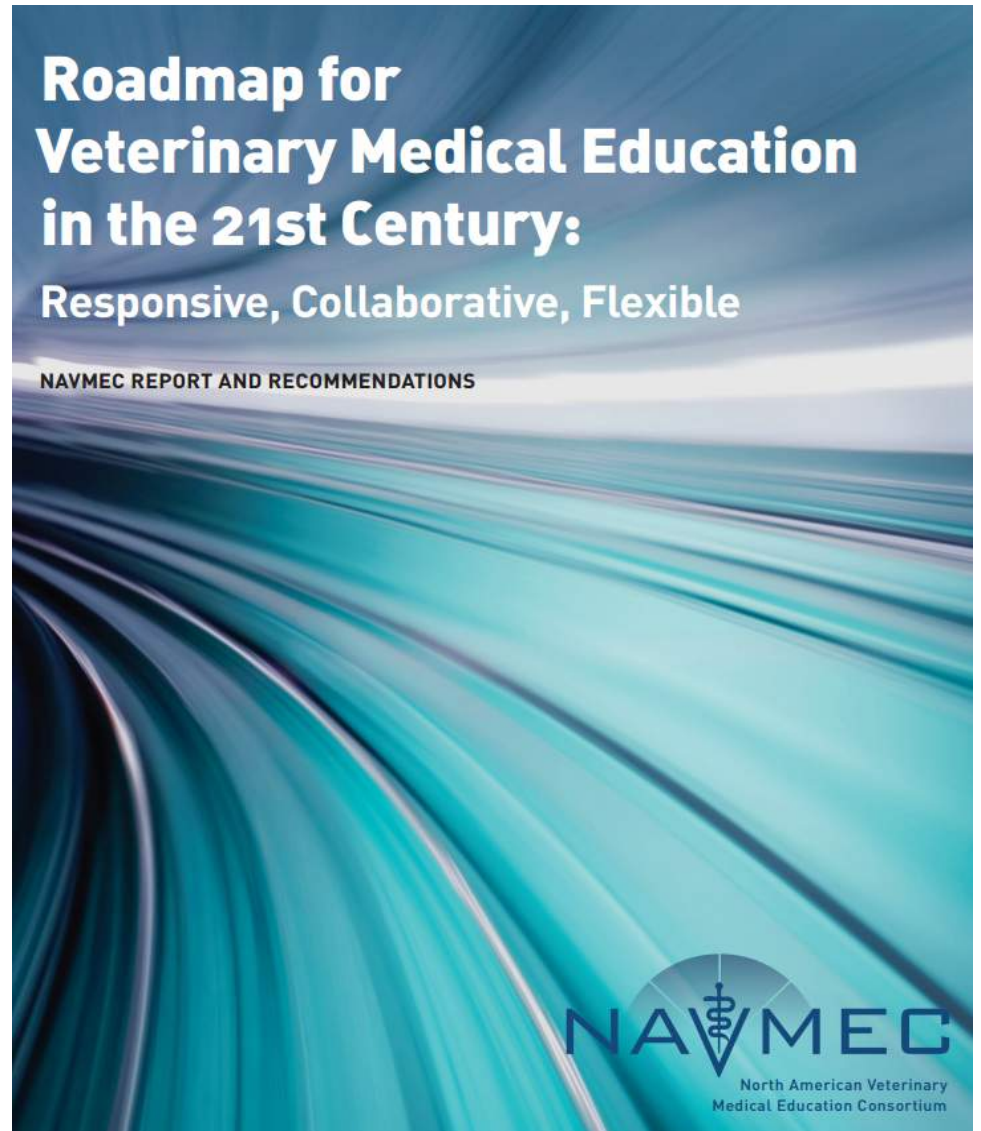
1. Epidemiology
2. Transboundary animal diseases
3. Zoonoses, including foodborne diseases
4. Emerging and re-emerging diseases
5. Disease prevention and control
6. Food hygiene
7. Veterinary products
8. Animal welfare
9. Veterinary legislation and ethics
10. General certification procedures
11. Communication skills

1. Clinical reasoning and decision-making
2. Individual animal care and management
3. Animal population care and management
4. Public health
5. Communication
6. Collaboration
7. Professionalism and professional identity
8. Financial and practice management
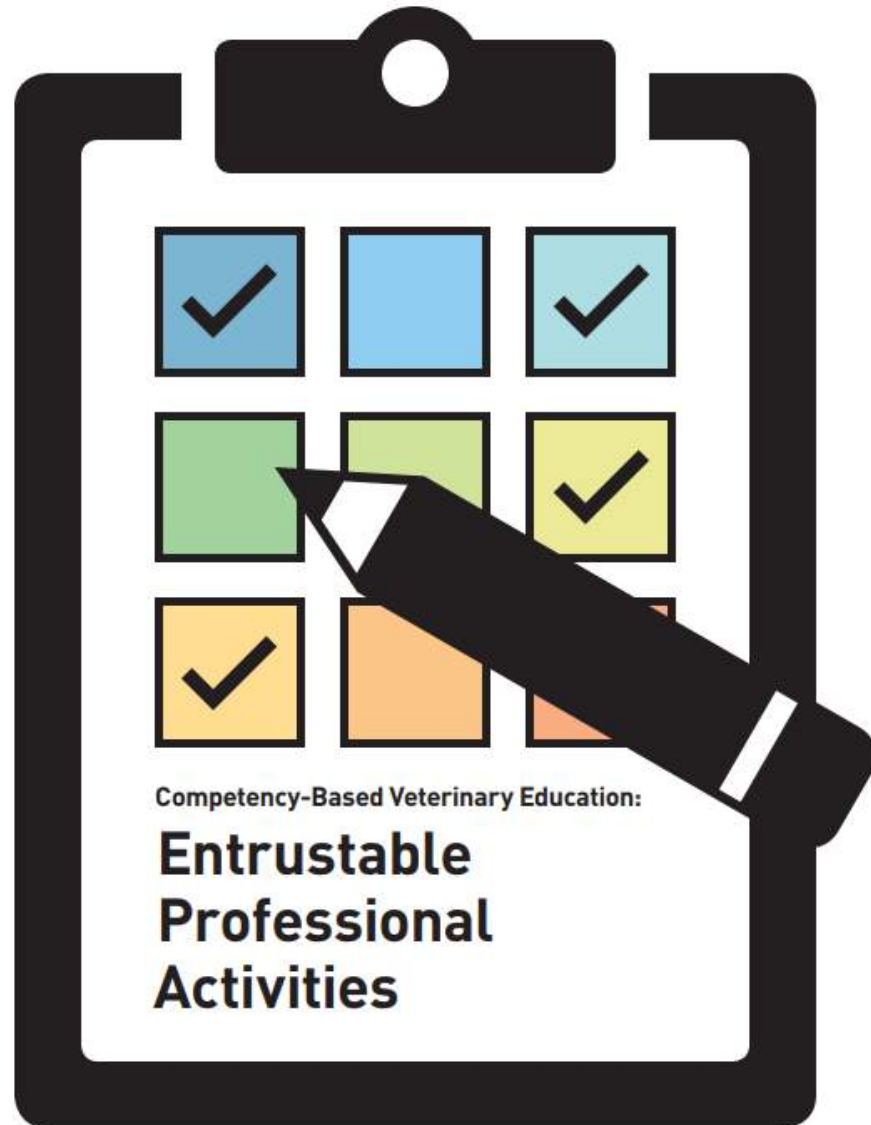9. Scholarship

AAVMC CBVE
Competency-Based
Veterinary Education

Part 1

Competency-Based Veterinary Education:
CBVE framework

1		**Clinical Reasoning and Decision-making**
2		**Individual Animal Care and Management**
3		**Animal Population Care and Management**
4		**Public Health**
5		**Communication**
6		**Collaboration**
7		**Professionalism and Professional Identity**
8		**Financial and Practice Management**
9		**Scholarship**

Entrustable Professional Activities

- Not an alternative for competencies, but a means to translate competencies into clinical practice

- Competencies are descriptors of veterinarians

- EPAs are descriptors of work

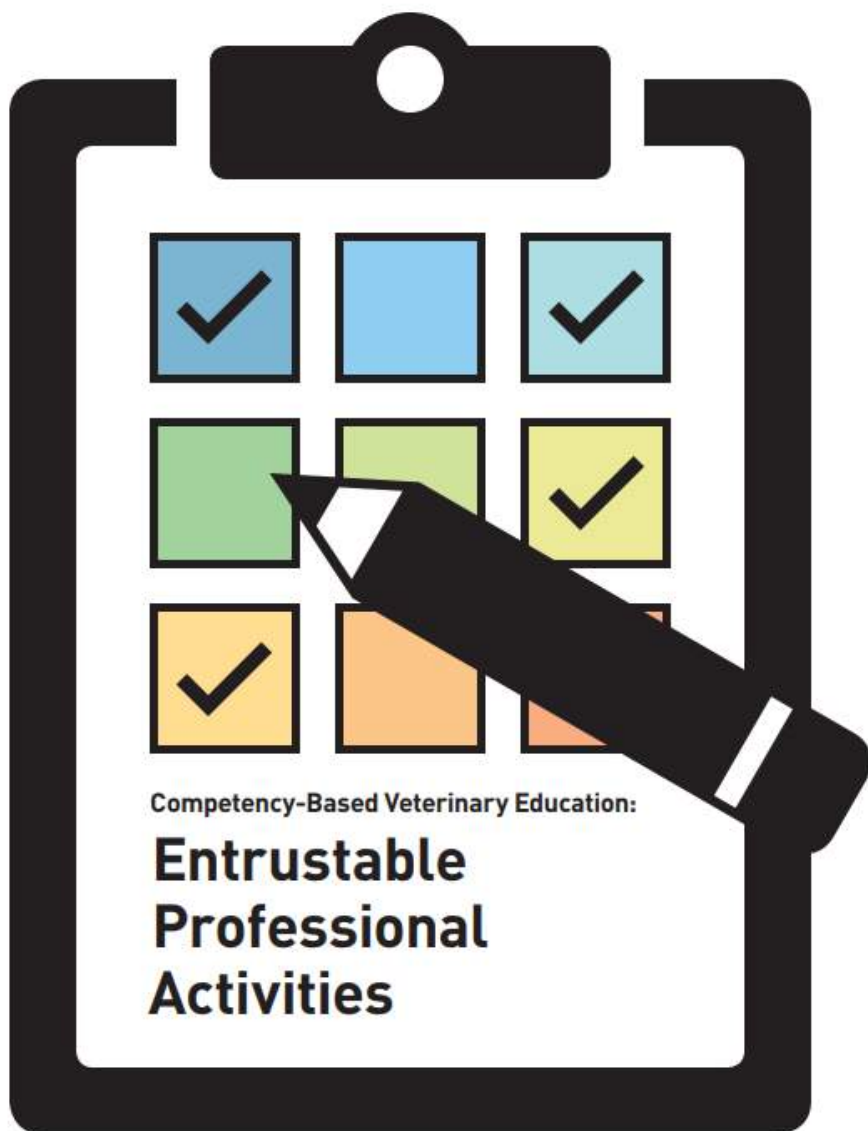- EPAs usually require multiple competencies in an integrative, holistic nature
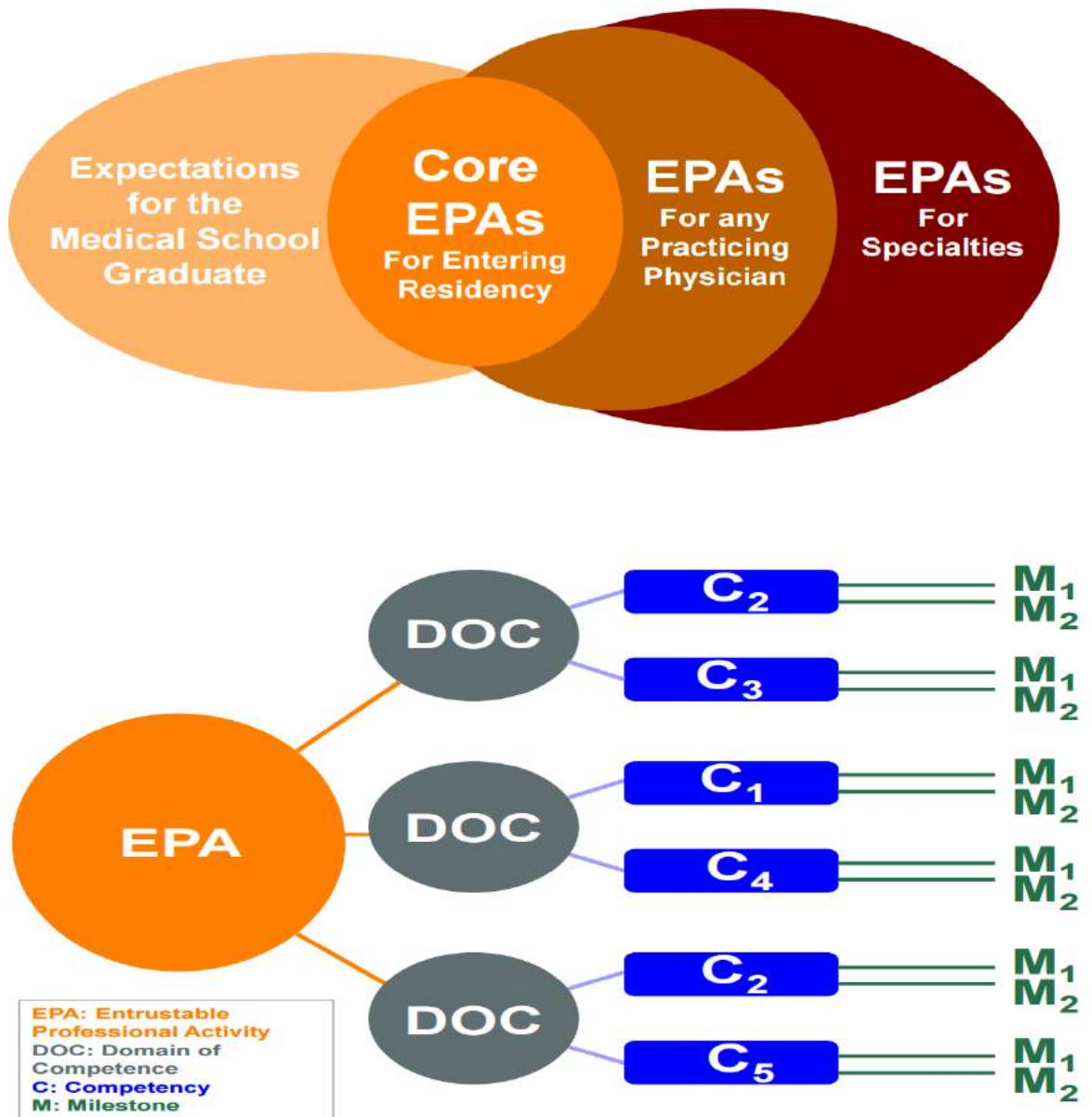
ten cate, O. Nuts and bolts of entrustable professional activities. *J Grad Med Ed*, March 2013.

Competency-Based Veterinary Education:

Entrustable Professional Activities

AAVMC CBVE — Competency-Based Veterinary Education — Part 2

EPAs

1	Gather a history, perform an examination, and create a prioritized differential diagnosis list
2	Develop a diagnostic plan and interpret results
3	Develop and implement a management/treatment plan
4	Recognize a patient requiring urgent or emergent care and initiate evaluation and management
5	Formulate relevant questions and retrieve evidence to advance care
6	Perform a common surgical procedure on a stable patient, including pre-operative and post-operative management
7	Perform general anesthesia and recovery of a stable patient including monitoring and support
8	Formulate recommendations for preventive healthcare

CBVE
Competency-Based Veterinary Education

Part 2

Competency-Based Veterinary Education:

Entrustable Professional Activities

EPA 1

Gather a history, perform an examination, and create a prioritized differential diagnosis list

DESCRIPTION OF ACTIVITY	Perform a history and exam on an individual animal or herd/flock and assimilate the information collected to derive a prioritized differential diagnosis.
COMMENTARY	The history and examination should be tailored to the clinical situation and specific patient encounter. This data gathering serves as the foundation for evaluation and management. Expectations include integration of the scientific foundations of medicine with clinical reasoning skills to guide information gathering.
MOST RELEVANT DOMAINS	1: **Clinical Reasoning & Decision-making** ■ 5: **Communication** ■
SECONDARY DOMAINS	2: Individual Animal Care & Management ■ 6: Collaboration ■ 8: Financial & Practice Management ■

Competency-Based Education

- De-emphasize time-based training
  - Develop students' abilities
  - Flexible, individually-oriented curriculum

- Promote learner-centeredness
  - Students take responsibility for their own learning
  - Develop skill in seeking and providing feedback

Competency-Based Time-Variable Education

CONFERENCE RECOMMENDATIONS

June 14–17, 2017 | Atlanta, GA

Achieving Competency-Based, Time-Variable Health Professions Education

Recommendations from the Macy Foundation Conference

Consensus Vision Statement

With the achievement of competency-based, time-variable health professions education, we envision a health care system in which all learners and practitioners are actively engaged in their own education and continuing professional development to improve the health of the public. In this system, learners and faculty partner to co-produce learning, all practitioners are life long learners, and all health care environments place a high value on learning.

ACADEMIC MEDICINE

March 2018 - Volume 93 - Competency-Based, Time-Variable Education in the Health Professions 3S
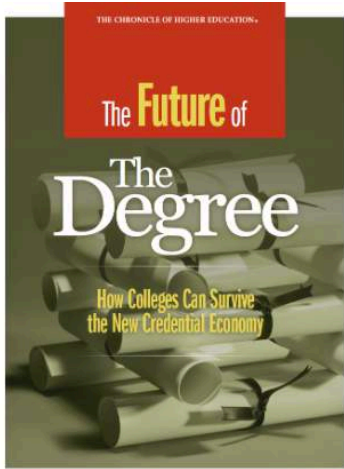
The Future of the Degree:
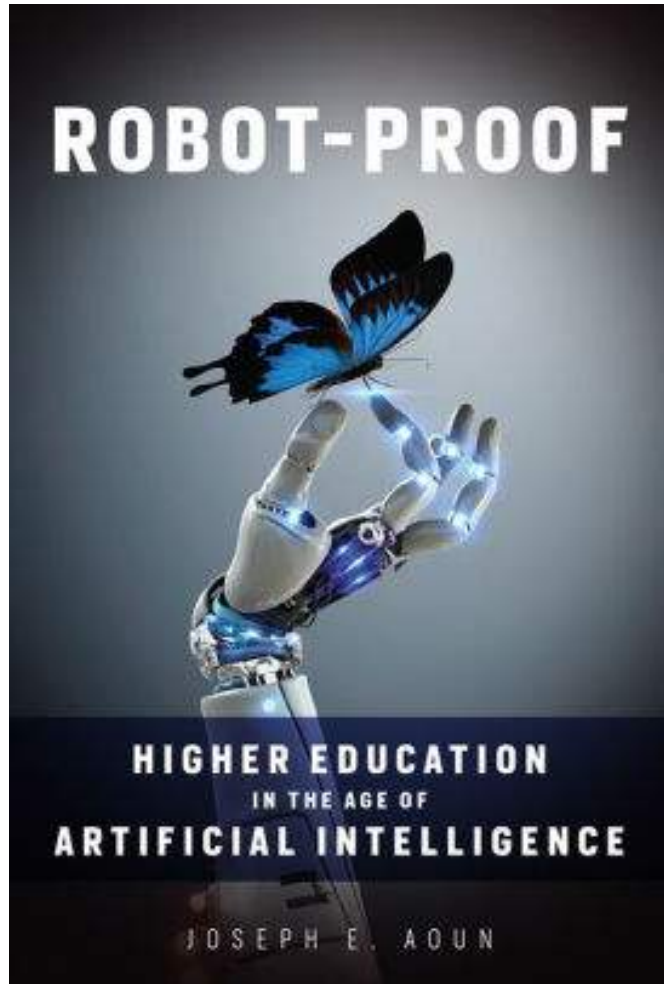How Colleges Can Survive the
New Credential Economy

Jeffrey J. Selingo
Chronicle of Higher Education
August 18, 2017

3.2: HOW THE OPEN LOOP UNIVERSITY WORKS

In 2014, Stanford University's d.school developed a proposal for what it called an "open loop university," which would admit students for six years of study that could be undertaken at any time in life.

On campus

6 years to use
when you want

Come back
to teach or
learn

Pitch to
re-enter

Off campus

Leave when outside loops
are more useful
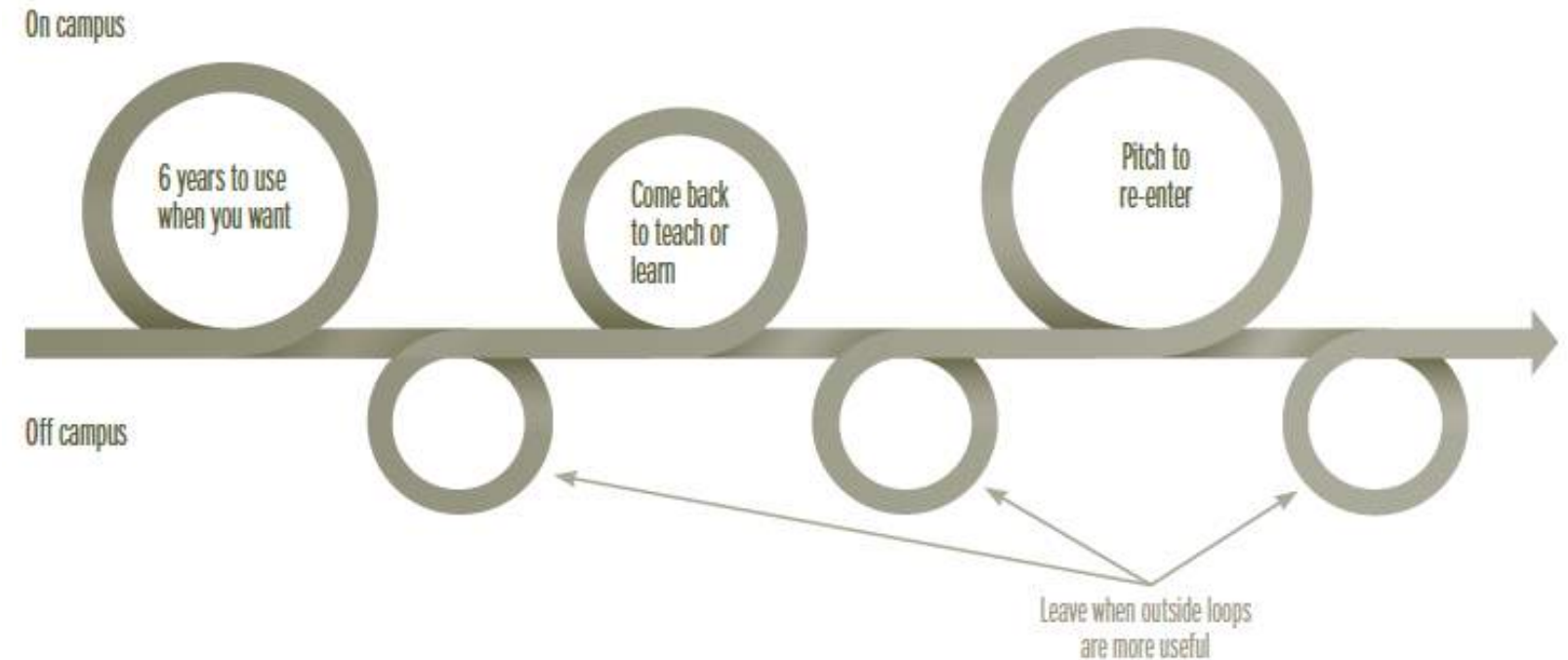
Humanics

New Literacies

- Data literacy
- Technological literacy
- Human literacy

Cognitive Capacities

- Systems thinking
- Entrepreneurship
- Cultural agility
- Critical thinking

The Future of the Professions

Emerging Skills and Competencies

- Task analysis, disintermediation, reintermediation
- Relationship with technology and machines
- Mastery of data
- Design thinking
- Systems engineering
- Diversification into new disciplines

'A Financial Times Book of the Year'

RICHARD DANIEL
SUSSKIND SUSSKIND

THE FUTURE OF
THE PROFESSIONS

HOW TECHNOLOGY WILL TRANSFORM
THE WORK OF HUMAN EXPERTS
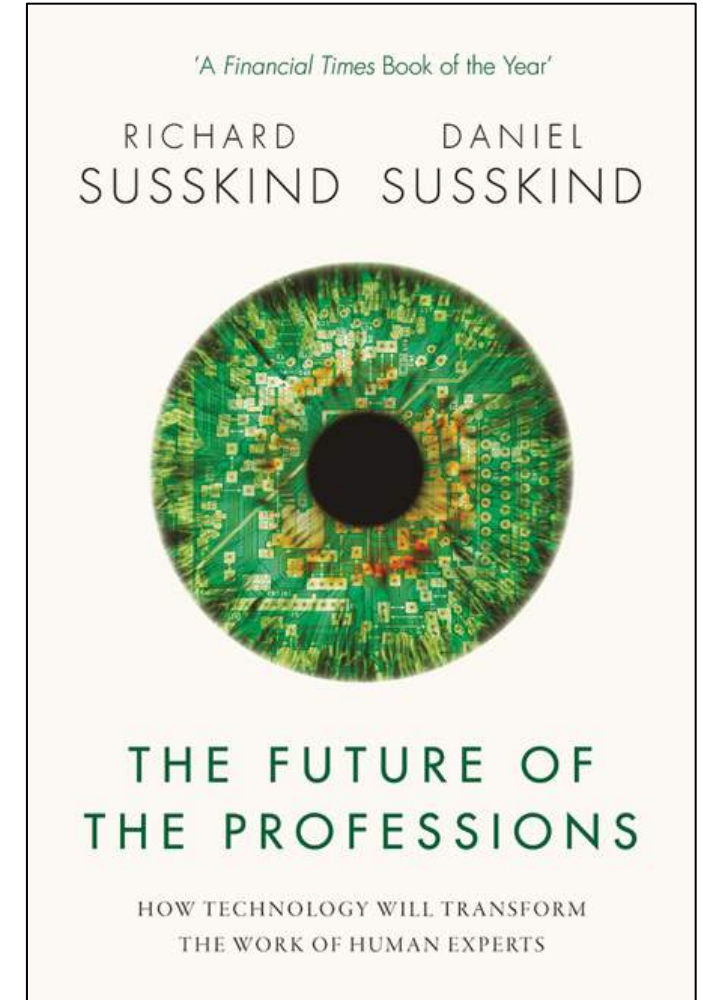
Importance of Diversity

Cognitive Routine Data Entry	Cognitive Nonroutine Medical Researcher
Manual Routine Assembly Line Worker	Manual Nonroutine Nursing Home Worker

Diversity Bonus
- Teams of people
- Complex disciplines
- Complex issues

Cognitive Diversity
- Information
- Knowledge
- Representations
- Mental models
- Hueristics
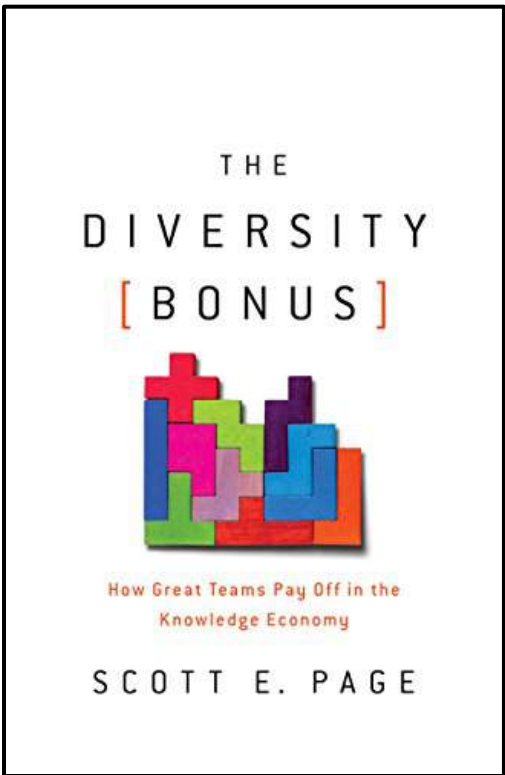
Identity Diversity
- Race
- Gender
- Age
- Sexual orientation
- Physical capabilities

THE DIVERSITY [BONUS]

How Great Teams Pay Off in the Knowledge Economy

SCOTT E. PAGE

Newsletter

- **Subscribe to the CIVME Newsletter**

The Council on International Veterinary Medical Education

AAVMC
Association of American
Veterinary Medical Colleges

US/Canada | UK/Ireland | Continental Europe | Australia/New Zealand | Africa | Latin America/Caribbean | China/South Asia/India | Middle East/North Africa

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aavmc.org
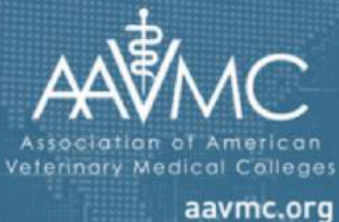
》》》 AAVMC
CIVME News
Council for International Veterinary Medical Education

Spring 2018, Volume 2:2

CIVME Meets During AAVMC's Annual Symposium in Washington, D.C.

CIVME members met face-to-face at the annual AAVMC meeting in Washington, D.C. on March 1st, 2018. The meeting was a productive one that focused on selecting the winners of the 2018 Educational Research micro-grants, developing a marketing and outreach strategy for the council, re-evaluating the governance structure of the council and determining long-term outcomes and metrics. The council was pleased to have input from several guests and staff members of AAVMC. Rotation of council members will start over the next couple of years as CIVME seeks to establish itself as a mature initiative of the AAVMC organization. This year, Dr. Fei Rong Mei and Dr. John David Kabasa, both rotate off the council as their terms come to an end, and CIVME thanks them very much for their service and support during our developmental phase. Please click here to read more about the meeting and the new leaders who have joined our Council!
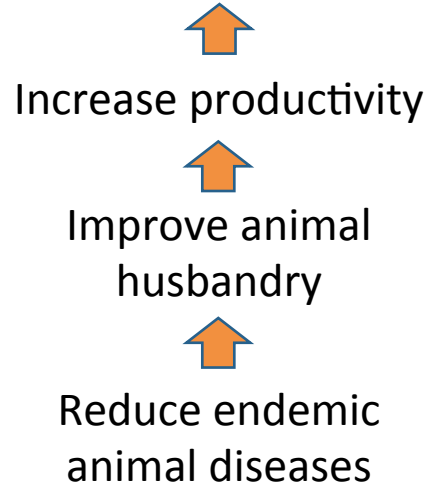
Resources

- **CIVME Educational Research Grant Program**

- **Websites of Interest**

- **Upcoming Events**

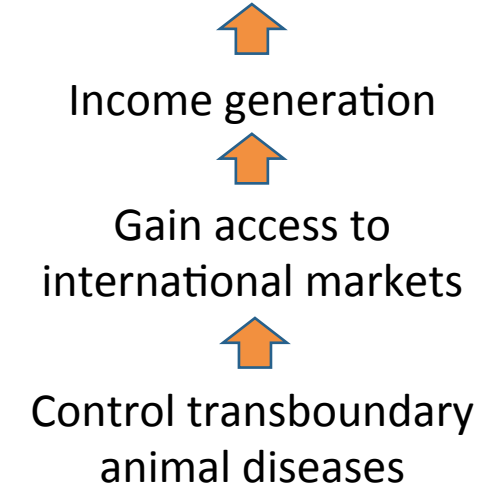- **Journals of Veterinary & Medical Education**

OIE PVS Pathway
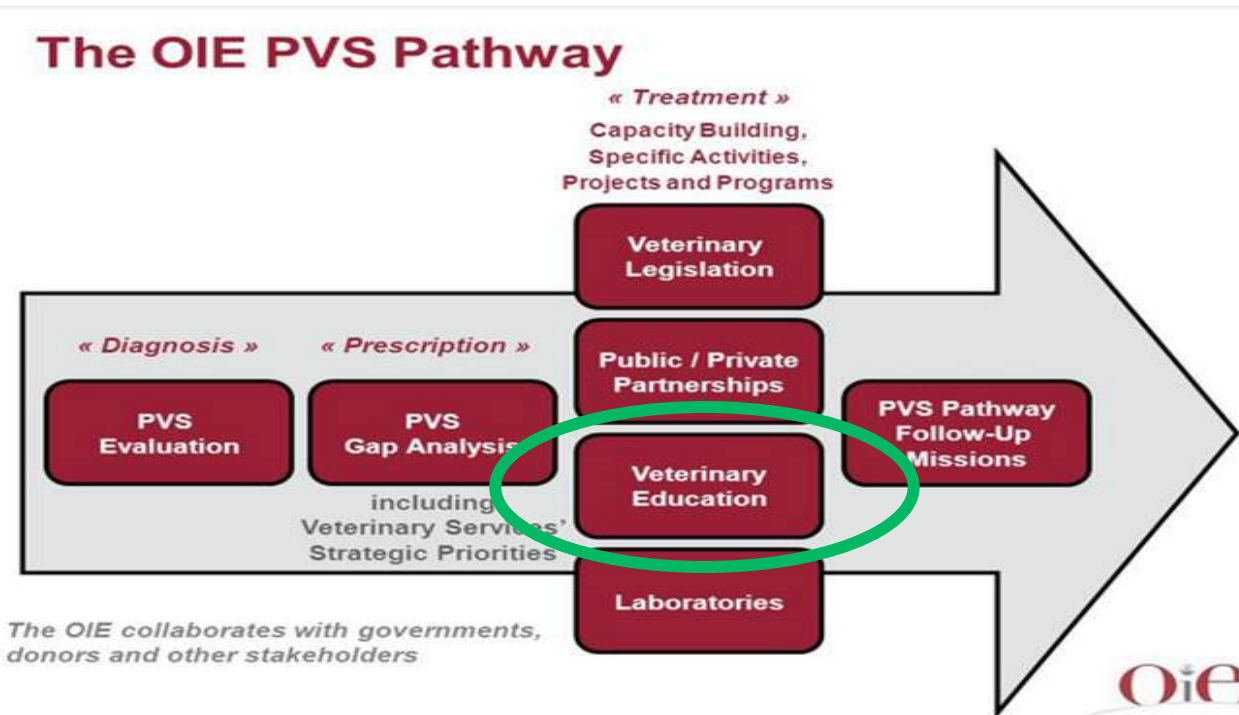
- Good governance of animal health systems based on a close public/ private partnership is the responsibility of all governments.

- If one country fails, it may endanger its neighboring countries, the region, the continent and potentially the entire planet.

Develop a well-educated veterinary workforce
   to protect human and animal health

- Assure the quality of education
- Promote continuous quality improvement

Who Benefits?

- Society – quality of veterinary services
- Students – investment in education
- Profession – competencies of graduates
- Schools – ongoing process improvement

Members of the Class of 2015 don their white coats at a December 2013

- Objective standards
- Institutional self-study
- Peer review, site visits
- Status decision
- Monitoring and oversight
- Due process, control of COIs

Promotes a culture of

Continuous Quality Improvement

- Data-based decision making
- Competitive benchmarking
- Change and innovation are encouraged and valued

Customer orientation

Employee empowerment

Ensures education is

relevant to societal needs

- Stakeholder input
- Periodic review
- Competency-based
- Outcomes assessment

- Global mark of recognition
- Improve the quality of veterinary medical education worldwide
- Protect human and animal health
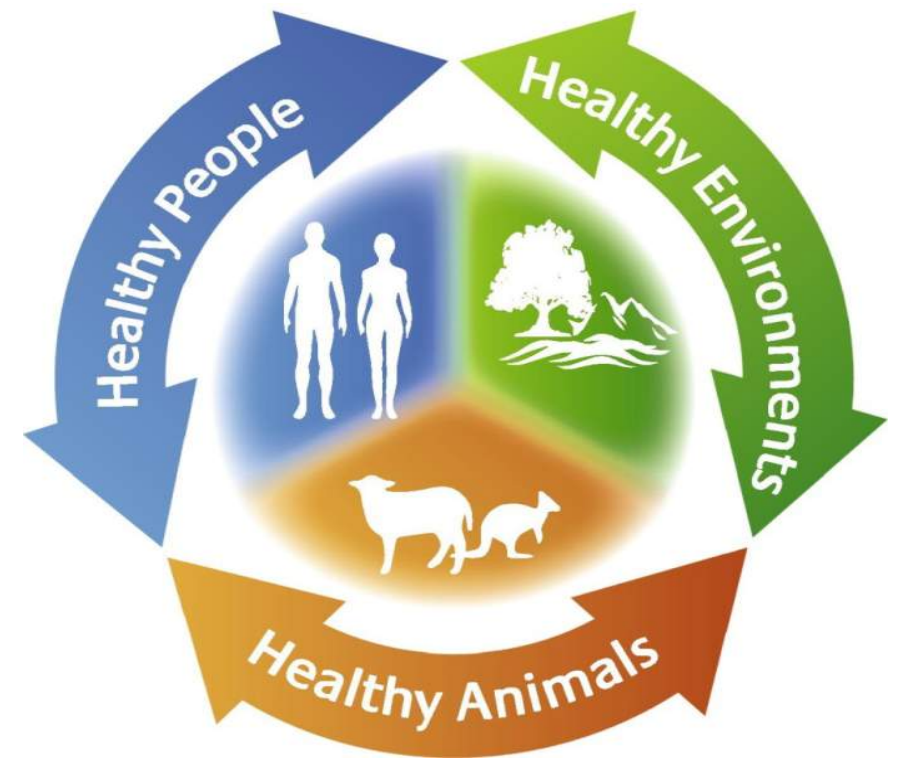
"An independent, transparent and rigorous method of ensuring that accreditation of medical schools worldwide is at an internationally accepted and high standard."

- WFME does not accredit individual medical schools
- WFME evaluates compliance of accrediting agencies with pre-defined criteria
- WFME generates much-needed data about UGME internationally

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What's the point?

- Veterinary medicine is a global public good
- The quality of veterinary services is directly related to the quality of education
- Accreditation ensures that education is based on competencies that meet societal needs
- Accreditation promotes a culture of continuous quality improvement
- Global recognition of accreditation systems will improve education worldwide

"We are all in this together"