



ANDHRA LOYOLA INSTITUTE OF ENGINEERING AND TECHNOLOGY VIJAYAWADA – 520 008

ICT Classrooms of S & H Department

The Life and Legacy of **RACHEL CARSON**

Silent Spring 2N2 ECE-1(S&H)

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2019-06-21(Fri) 02:16(PM)

LIVE SCIENCE

What Is Quantum Mechanics?

By Robert Coleman, Live Science Contributor | September 28, 2014 08:36am ET

Quantum mechanics is the branch of physics relating to the very small.

It results in what may appear to be some very strange conclusions about the physical world. As the scale of atoms and electrons, many of the equations of classical mechanics, which describe how things move at everyday sizes and speeds, cease to be useful. In classical mechanics, objects exist in a specific place at a specific time. However, in quantum mechanics, objects instead exist at a haze of probability; they have a certain chance of being at point A, another chance of being at point B, and so on.

Three revolutionary principles

Quantum mechanics (QM) developed over many decades, beginning as a

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History (cont.)

Differential equations first came into existence with the invention of calculus by Newton and Leibniz. In Chapter 2 of his 1687 work *Philosophiæ Naturalis Principia Mathematica*, Isaac Newton stated three cases of differential equations:

$$\frac{dy}{dx} = f(x)$$

$$\frac{dy}{dx} = f(x, y)$$

$$\frac{dy}{dx} + p(x)y = q(x)$$

In all three cases, y is a unknown function of x (or of x_1 and x_2), and f is a given function.

The three cases are not mutually exclusive, and often using various cases and discussing the non-uniqueness of solutions.

Joseph Fourier generalized the Bernoulli differential equation in 1822. This is an ordinary differential equation of the form

$$y' = P(x)y + Q(x)y^n$$

for which the following year, Fourier obtained solutions by integrating y^{-n} .

Independently, the problem of alternating series such as that of a musical instrument was studied by Jean le Rond d'Alembert, Leonhard Euler, Daniel Bernoulli, and Joseph-Louis Lagrange (1736-1813). The Euler-Lagrange equation was developed in the 1770s by Euler and Lagrange in connection with their studies of the brachistochrone problem. This is the problem of determining a curve on which a weighted particle will fall to a fixed point in a fixed amount of time, independent of the starting point. Lagrange solved this problem in 1750 and sent the solution to Euler. Both further developed Lagrange's method and applied it to mechanics, which led to the formulation of Lagrangian mechanics.

In 1822, Fourier published his work on heat flow in *Théorie analytique de la chaleur* (The Analytic Theory of Heat), in which he based his reasoning on Fourier's law of cooling, namely, that the flow of heat between two adjacent materials is proportional to the extremely small difference of their temperatures. Combined in this book was Fourier's proposal of the heat equation for conductive diffusion of heat. This partial differential equation is now taught to every student of mathematical physics.

For example, in classical mechanics, the motion of a body is described by its position and velocity as the time varies (or, conversely, these variables to be expressed dynamically given the position, velocity, acceleration and various forces acting on the body) as a differential equation for the unknown position of the body as a function of time.

In some cases, this differential equation (called an equation of motion) may be solved explicitly.

An example of measuring a new second-order ordinary differential equation is the determination of the velocity of a ball falling through the air, considering only gravity and air resistance. The ball's acceleration

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Green chemistry's 12 principles

These principles demonstrate the breadth of the concept of green chemistry:

- 1. Prevent waste:** Design chemical syntheses to prevent waste. Leave no waste to treat or clean up.
- 2. Maximize atom economy:** Design syntheses so that the final product contains the maximum proportion of the starting materials. Waste few or no atoms.
- 3. Design less hazardous chemical syntheses:** Design syntheses to use and generate substances with little or no toxicity to either humans or the environment.
- 4. Design safer chemicals and products:** Design chemical products that are fully effective yet have little or no toxicity.
- 5. Safer solvents and reaction conditions:** Avoid using solvents, separation agents, or other auxiliary chemicals. If you must use these, choose the safest.
- 6. Use energy efficiency:** Run chemical reactions at room temperature and pressure whenever possible.
- 7. Use renewable feedstocks:** Use starting materials (also known as feedstocks) that are renewable rather than depletable. The source of raw materials is often agricultural products or the wastes of other processes; the source of depletable feedstocks is often fossil fuels (oil, gas, or coal) or mining operations.
- 8. Derivatives:** Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and waste.
- 9. Catalytic reagents:** Minimize waste by using catalytic reactions. Catalysts are effective in small amounts and can be used many times. They are preferable to stoichiometric reagents, which are used in excess and carry out a reaction.

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Embezzlement

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