LIVES IN THE 18TH CENTURY

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INTRODUCTION[1]

Human history as cultural history

We need to reform our teaching of history so that the emphasis will be placed on the gradual growth of human culture and knowledge, a growth to which all nations and ethnic groups have contributed.

This book is part of a series on cultural history. Here is a list of the other books in the series that have, until now, been completed:

- Lives in the 18th Century
- Lives in Biology
- Lives of Some Great Novelists
- lives in Mathematics
- Lives in Exploration
- Lives in Education
- Lives in Poetry
- Lives in Painting
- Lives in Engineering
- Lives in Astronomy
- Lives in Chemistry
- Lives in Medicine
- Lives in Ecology
- Lives in Physics
- Lives in Economics
- Lives in the Peace Movement

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https://www.johnavery.info/

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[1]This book makes some use of my previously-published book chapters, but much of the material is new.

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Chapter 1

VOLTAIRE AND ROUSEAU

To the intellectuals of the 18th century, the orderly Newtonian cosmos, with its planets circling the sun in obedience to natural law, became an imaginative symbol representing rationality. In their search for a society more in accordance with human nature, 18th century Europeans were greatly encouraged by the triumphs of science. Reason had shown itself to be an adequate guide in natural philosophy. Could not reason and natural law also be made the basis of moral and political philosophy? In attempting to carry out this program, the philosophers of the Enlightenment laid the foundations of psychology, anthropology, social science, political science and economics.

One of the earliest and most influential of these philosophers was John Locke (1632-1705), a contemporary and friend of Newton. In his *Second Treatise on Government*, published in 1690, John Locke's aim was to refute the doctrine that kings rule by divine right, and to replace that doctrine by an alternative theory of government, derived by reason from the laws of nature. According to Locke's theory, men originally lived together without formal government:

"Men living together according to reason," he wrote, "without a common superior on earth with authority to judge between them, is properly the state of nature... A state also of equality, wherein all the power and jurisdiction is reciprocal, no one having more than another; there being nothing more evident than that creatures of the same species, promiscuously born to all the same advantages of nature and the use of the same facilities, should also be equal amongst one another without subordination or subjection..."

"But though this be a state of liberty, yet it is not a state of licence... The state of nature has a law to govern it, which obliges every one; and reason, which is that law, teaches all mankind who will but consult it, that being equal and independent, no one ought to harm another in his life, health, liberty or possessions."

In Locke's view, a government is set up by means of a social contract. The government is given its powers by the consent of the citizens in return for the services which it renders to them, such as the protection of their lives and property. If a government fails to render these services, or if it becomes tyrannical, then the contract has been broken, and the citizens must set up a new government.

Locke's influence on 18th century thought was very great. His influence can be seen,

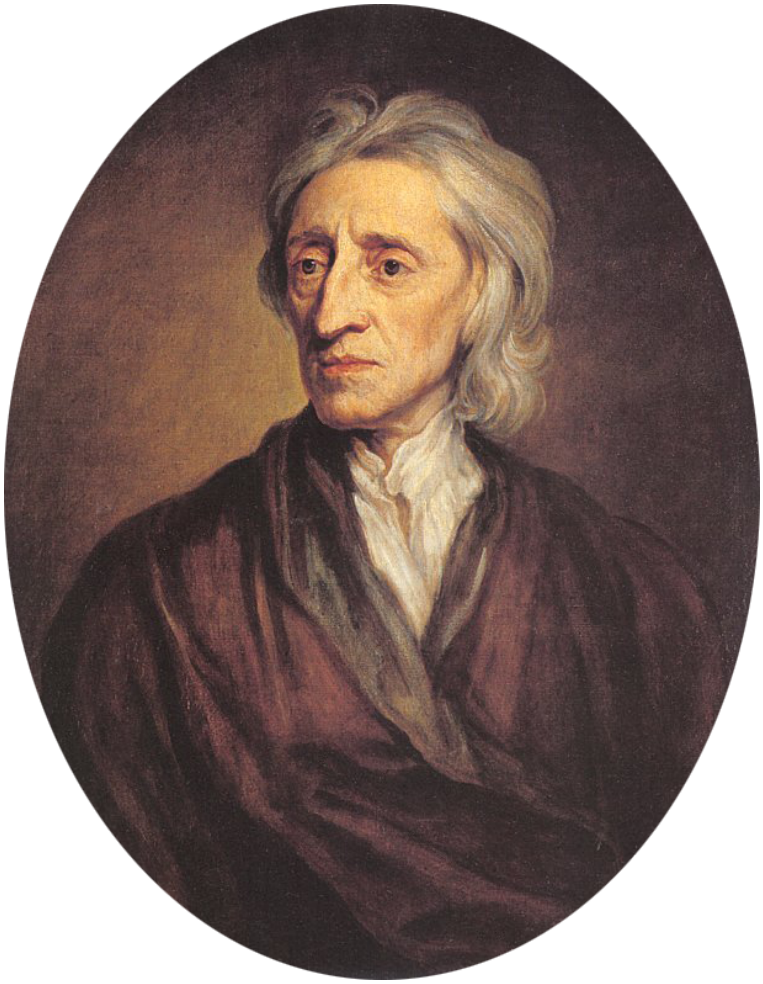


Figure 1.1: **John Locke (1632-1705): "Men living together according to reason, without a common superior on earth with authority to judge between them, is properly the state of nature... A state also of equality, wherein all the power and jurisdiction is reciprocal, no one having more than another; there being nothing more evident than that creatures of the same species, promiscuously born to all the same advantages of nature and the use of the same facilities, should also be equal amongst one another without subordination or subjugation..."**

for example, in the wording of the American Declaration of Independence. In England, Locke's political philosophy was accepted by almost everyone. In fact, he was only codifying ideas which were already in wide circulation and justifying a revolution which had already occurred. In France, on the other hand, Locke's writings had a revolutionary impact.

Credit for bringing the ideas of both Newton and Locke to France, and making them fashionable, belongs to Francois Marie Arouet (1694-1778), better known as "Voltaire". Besides persuading his mistress, Madame de Chatelet, to translate Newton's *Principia* into French, Voltaire wrote an extremely readable commentary on the book; and as a result, Newton's ideas became highly fashionable among French intellectuals. Voltaire lived with Madame du Chatelet until she died, producing the books which established him as the leading writer of Europe, a prophet of the Age of Reason, and an enemy of injustice, feudalism and superstition.

The Enlightenment in France is considered to have begun with Voltaire's return from England in 1729; and it reached its high point with the publication of of the *Encyclopedia* between 1751 and 1780. Many authors contributed to the *Encyclopedia*, which was an enormous work, designed to sum up the state of human knowledge.

Turgot and Montesquieu wrote on politics and history; Rousseau wrote on music, and Buffon on natural history; Quesnay contributed articles on agriculture, while the Baron d'Holbach discussed chemistry. Other articles were contributed by Condorcet, Voltaire and d'Alembert. The whole enterprise was directed and inspired by the passionate faith of Denis Diderot (1713-1784). The men who took part in this movement called themselves *"philosophes"*. Their creed was a faith in reason, and an optimistic belief in the perfectibility of human nature and society by means of education, political reforms, and the scientific method.

The *philosophes* of the Enlightenment visualized history as a long progression towards the discovery of the scientific method. Once discovered, this method could never be lost; and it would lead inevitably (they believed) to both the material and moral improvement of society. The *philosophes* believed that science, reason, and education, together with the principles of political liberty and equality, would inevitably lead humanity forward to a new era of happiness. These ideas were the faith of the Enlightenment; they influenced the French and American revolutions; and they are still the basis of liberal political belief.

1.1 Voltaire and Rousseau

Voltaire (1694-1778)

Francois-Marie Arouet, who later changed his name to Voltaire, was born in Paris. His father was a lawyer and a minor treasury official, while his mother's family was on the lowest rank if the French nobility. He was educated by Jesuits at Collège Louis-le-Grande, where he learned Latin theology and rhetoric. He later became fluent in Italian, Spanish and English.

Despite his father's efforts to make him study law, the young Voltaire was determined to

become a writer. He eventually became the author of more than 2,000 books and pamphlets and more than 20,000 letters. His works include many forms of writing, including plays, poems, novels, essays and historical and scientific works. His writings advocated civil liberties, and he used his satirical and witty style of writing to criticize intolerance, religious dogma and absolute monarchy. Because of the intolerance and censorship of his day, he was frequently in trouble and sometimes imprisoned. Nevertheless, his works were very popular, and he eventually became extremely rich, partly through clever investment of money gained through part ownership of a lottery.

During a period of forced exile in England, Voltaire mixed with the English aristocracy, meeting Alexander Pope, John Gay, Jonathan Swift, Lady Mary Wortley Montague, Sarah, Duchess of Marlborough, and many other members of the nobility and royalty. He admired the English system of constitutional monarchy, which he considered to be far superior to the absolutism then prevailing in France. In 1733, he published a book entitled *Letters concerning the English Nation*, in London. When French translation was published in 1734, Voltaire was again in deep trouble. In order to avoid arrest, he stayed in the country château belonging to Émilie du Châtelet and her husband, the Marquis du Châtelet.

As a result, Madame du Châtelet became his mistress and the relationship lasted for 16 years. Her tolerant husband, the Marquis, who shared their intellectual and scientific interests, often lived together with them. Voltaire paid for improvements to the château, and together, the Marquis and Voltaire collected more than 21,000 books, and enormous number for that time. Madame du Châtelet translated Isaac Newton's great book, *Principia Mathematica*, into French, and her translation was destined to be the standard one until modern times. Meanwhile, Voltaire wrote a French explanation of the ideas of the *Principia*, which made these ideas accessible to a wide public in France. Together, the Marquis, his wife and Voltaire also performed many scientific experiments, for example experiments designed to study the nature of fire.

Voltaire's vast literary output is available today in approximately 200 volumes, published by the University of Oxford, where the Voltaire Foundation is now established as a research department.

Rousseau (1712-1778)

In 1754 Rousseau wrote: "The first man who, having fenced in a piece of land, said 'This is mine', and found people naïve enough to believe him, that man was the true founder of civil society. From how many crimes, wars, and murders, from how many horrors and misfortunes might not any one have saved mankind, by pulling up the stakes, or filling up the ditch, and crying to his fellows: Beware of listening to this impostor; you are undone if you once forget that the fruits of the earth belong to us all, and the earth itself to nobody."

Later, he began his influential book *The Social Contract*, published in 1752, with the dramatic words: "Man is born free, and everywhere he is in chains. Those who think themselves the masters of others are indeed greater slaves than they." Rousseau concludes Chapter 3 of this book with the words: "Let us then admit that force does not create right,

Figure 1.2: **Voltaire used his satirical and witty style of writing to criticize intolerance, religious dogma and absolute monarchy. He wrote more than 2,000 books and pamphlets and more than 20,000 letters. His writings made a significant contribution to the Enlightenment, and paved the way for revolutions both in France and America.**

Figure 1.3: **The frontpiece of Voltaire's book popularizing Newton's ideas for French readers. Madame du Châtelet appears as a muse, reflecting Newton's thoughts down to Voltaire.**

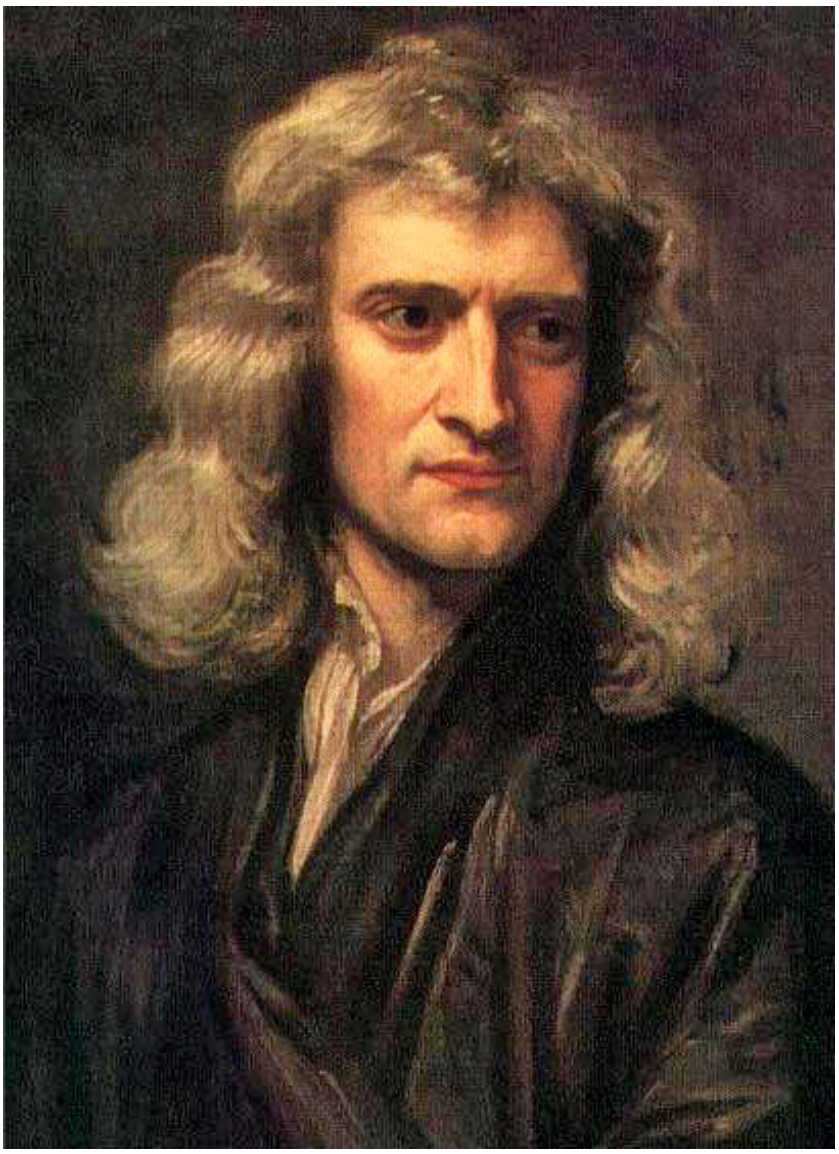


Figure 1.4: **The work of Sir Isaac Newton (1642-1726) illustrates a key aspect of human cultural evolution: Because of the introduction of printing in Europe, Newton was able to build on the work of his predecessors, Copernicus, Brahe, Galileo and Kepler. He could never have achieved his great synthesis alone. During the Enlightenment, Newton became a symbol of rationality and reason. Alexander Pope wrote: "Nature, and nature's laws, lay hid in night. God said 'Let Newton be', and all was light!"**

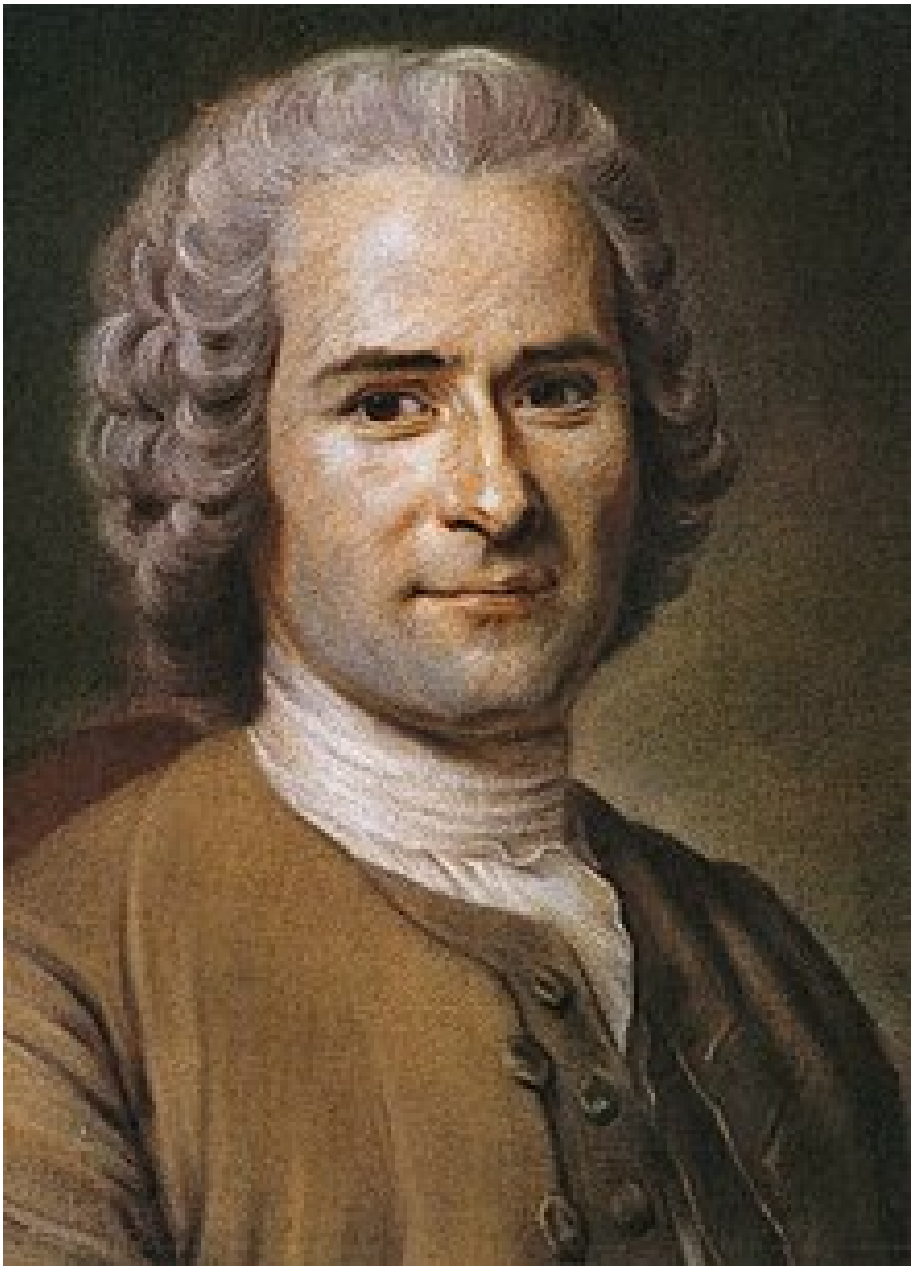


Figure 1.5: **Unlike Voltaire, Rousseau was not an advocate of science, but instead believed in the importance of emotions. He believed that civilization has corrupted humans rather than making them better. Rousseau was a pioneer of the romantic movement. His book, *The Social Contract*, remains influential today.**

and that we are obliged to obey only legitimate powers". In other words, the ability to coerce is not a legitimate power, and there is no rightful duty to submit to it. A state has no right to enslave a conquered people.

These ideas, and those of John Locke, were reaffirmed in 1776 by the American Declaration of Independence: "We hold these truths to be self-evident: That all men are created equal. That they are endowed by their Creator with certain inaliable rights, and the among these are the rights to life, liberty and the pursuit of happiness; and that to pursue these rights, governments are instituted among men, deriving their just powers from the consent of the governed."

Today, in an era of government tyranny and subversion of democracy, we need to remember that the just powers of any government are not derived from the government's ability to use of force, but exclusively from the consent of the governed.

1.2 The printer and publisher Joseph Johnson

As an example of the influence of printing on the liberation of ideas, we can consider the circle of important authors that formed around the English printer and publisher Joseph Johnson (1738-1809). His weekly dinners for authors were famous. Among the many great thinkers. artists, scientists, writers and religious dissenters who attended these dinners, or whose works he published, were William Cowper, Erasmus Darwin, William Blake, Henry Fuseli, Mary Wollstonecraft, William Godwin, Thomas Robert Malthus, Thomas Paine, Pricilla Wakefield, Gilbert Wakefield. Benjamin Franklin, Richard Price and Joseph Priestley.

Throughout her career, the pioneering feminist writer Mary Wollstonecraft was aided by Johnson. As she wrote to her sister, she had decided to become the first of a new genus: a professional female writer. Having learned French and German, she translated Necker's *Of the Importance of Religious Opinions* and Saltzman's *Elements of Morality for the Use of Children*. Mary was helped in her new career by the liberal publisher, Joseph Johnson, who was also the publisher of Thomas Paine and William Godwin. Mary met these already famous authors at Johnson's dinner parties, and conversations with them helped to expand her knowledge and ambitions. Joseph Johnson was a very brave man. By publishing the works of radical authors, he was risking arrest by England's repressive government. In her letters, Mary described Johnson as "a father and brother".

At Johnson's parties Mary met, for the second time, the famous novelist and philosopher William Godwin. This time, they both formed a higher opinion of each other than at their first meeting. A passionate love affair developed between them, and when Mary became pregnant, they were married. Tragically, Mary Wollstonecraft died in childbirth. Her daughter Mary would later become the wife of Godwin's admirer, the poet Percy Bysshe Shelley, and Mary Shelly created the enduring masterpiece *Frankenstein*.

Figure 1.6: **The printer and publisher Joseph Johnson (1738-1809). Johnson was the publisher of William Godwin, Mary Wollstonecraft and Thomas Paine. His dinner parties included many famous dissenting thinkers of the time.**

Figure 1.7: **Mary Wollstonecraft in a painting by John Opie. She called Joseph Johnson "my father and brother".**

Figure 1.8: **The famous scientist and dissenter, Joseph Priestley, in a portrait by Henry Fuseli, commissioned by Joseph Johnson. Priestley and Fuseli were among Johnson's closest friends.**

1.3 Mary Wollstonecraft's *Vindication of the Rights of Woman*

Mary Wollstonecraft, whom we mentioned above in connection with the publisher Joseph Johnson, published a book in 1792 entitled *Vindication of the Rights of Woman*. In it she said:

"My main argument is built on this simple principle, that if [woman] be not prepared by education to become the companion of man, she will stop the progress of knowledge and virtue; for truth must be common to all".

Wollstonecraft contends that society will degenerate without educated women, particularly because mothers are the primary educators of young children. She attributes the problem of uneducated women to men and to "...a false system of education, gathered from the books written on this subject by men who [consider] females rather as women than human creatures"

"Taught from their infancy that beauty is woman's scepter, the mind shapes itself to the body, and, roaming round its gilt cage, only seeks to adorn its prison.

"I then would fain convince reasonable men of the importance of some of my remarks; and prevail on them to weigh dispassionately the whole tenor of my observations. I appeal to their understandings; and, as a fellow-creature, claim, in the name of my sex, some interest in their hearts. I entreat them to assist to emancipate their companion, to make her a help meet for them! Would men but generously snap our chains, and be content with rational fellowship instead of slavish obedience, they would find us more observant daughters, more affectionate sisters, more faithful wives, more reasonable mothers: in a word, better citizens.

Chapter 2

BURNS AND BLAKE

2.1 Robert Burns, 1759-1796

To A Mouse

On Turning her up in her Nest with the Plough

Wee, sleekit, cow'rin', tim'rous beastie,
O what a panic's in thy breastie!
Thou need na start awa sae hasty,
Wi' bickering brattle!
I wad be laith to rin an' chase thee
Wi' murd'ring pattle!

I'm truly sorry man's dominion
Has broken nature's social union,
An' justifies that ill opinion
Which makes thee startle
At me, thy poor earth-born companion,
An' fellow-mortal!

I doubt na, whiles, but thou may thieve;
What then? poor beastie, thou maun live!
A daimen-icker in a thrave
'S a sma' request:
I'll get a blessin' wi' the lave,
And never miss't!

Thy wee bit housie, too, in ruin!
Its silly wa's the win's are strewin':

And naething, now, to big a new ane,
O' foggage green!
An' bleak December's winds ensuin'
Baith snell an' keen!

Thou saw the fields laid bare and waste
An' weary winter comin' fast,
An' cozie here, beneath the blast,
Thou thought to dwell,
Till, crash! the cruel coulter past
Out thro' thy cell.

That wee bit heap o' leaves an' stibble
Has cost thee mony a weary nibble!
Now thou's turned out, for a' thy trouble,
But house or hald,
To thole the winter's sleety dribble
An' cranreuch cauld!

But, Mousie, thou art no thy lane
In proving foresight may be vain:
The best laid schemes o' mice an' men
Gang aft a-gley,
An' lea'e us nought but grief an' pain,
For promised joy.

Still thou art blest, compared wi' me!
The present only toucheth thee:
But, oh! I backward cast my e'e
On prospects drear!
An' forward, tho' I canna see,
I guess an' fear!

Coming Through The Rye

Coming thro' the rye, poor body,
Coming thro' the rye,
She draiglet a' her petticoatie
Coming thro' the rye.

O, Jenny's a' wat, poor body;
Jenny's seldom dry;

Figure 2.1: **Robert Burns is regarded as the national poet of Scotland. Burns night is celebrated there each year, and Burns' song *Auld Lang Syne* is sung at the last day of the year (Hogmanay). Besides writing in the Scottish dialect, Burns also wrote in English, especially when expressing his political beliefs. He was a pioneer of the romantic movement, of liberalism and of socialism.**

She draiglet a' her petticoatie
Coming thro' the rye.

Gin a body meet a body
Coming thro' the rye,
Gin a body kiss a body-
Need a body cry?

Gin a body meet a body
Coming thro' the glen,
Gin a body kiss a body-
Need the warld ken?

Auld Lang Syne

Should auld acquaintance be forgot,
And never brought to mind?
Should auld acquaintance be forgot,
And auld lang syne?

For auld lang syne, my dear,
For auld lang syne,
We'll tak a cup o' kindness yet,
For auld lang syne.

And surely ye'll be your pint-stowp,
And surely I'll be mine!
And we'll tak a cup o' kindness yet,
For auld lang syne.

For auld lang syne, my dear,
For auld lang syne,
We'll tak a cup o' kindness yet,
For auld lang syne.

We twa hae run about the braes,
And pu'd the gowans fine;
But we've wandered mony a weary fit
Sin' auld lang syne.

For auld lang syne, my dear,
For auld lang syne,

We'll tak a cup o' kindness yet,
For auld lang syne.

We twa hae paidled i' the burn,
Frae morning sun till dine;
But seas between us braid hae roared
Sin' auld lang syne.

For auld lang syne, my dear,
For auld lang syne,
We'll tak a cup o' kindness yet,
For auld lang syne.

And there's a hand, my trusty fiere,
And gie's a hand o' thine!
And we'll tak a right guid-willie waught
For auld lang syne.

For auld lang syne, my dear,
For auld lang syne,
We'll tak a cup o' kindness yet,
For auld lang syne

2.2 William Blake, 1757-1827

Education as an engraver and printmaker

William Blake was born in 1757 in the Soho district of London. He was the third of seven children, two of whom died in infancy. His parents, who were English Dissenters, seem to have been reasonable wealthy during his childhood, since his father was able to purchase many books for him. Among these were books of engravings and drawings through which Blake became familiar with the works of Michelangelo, Raphael and Albrecht Dürer.

Recognizing their son's extremely independent temperament and his gifts as an artist, his parents sent him to an ordinary school only long enough to learn reading and writing, after which he was tutored at home by his mother, and later apprenticed to an engraver and printmaker. After he had finished his apprenticeship, the young Blake became a student at the Royal Academy. Finally, he opened his own engraving and printmaking shop.

Blake continued to read avidly on topics of all kinds, but was most influenced by his studies of the Bible.

Figure 2.2: **Newton depicted in a print by William Blake.**

Marriage

In 1782, while recovering from the pain of a rejected marriage proposal, Blake met Catherine Boucher, who was five years his junior. He told Catherine about the pain he had experienced and asked "Do you pity me?" When she answered that she did, Blake replied "Then I love you".

Blake's marriage to Catherine was an extremely happy one. She was illiterate, but he taught her to read and write. Later he also trained her as an engraver. She was an invaluable help to him, and she lifted his spirits whenever he was burdened by misfortunes. She said of her husband, "He is always in Heaven".

Political activity

William Blake's first collection of poems, *Poetical Sketches*, was printed around 1783. After his father's death, Blake and former fellow apprentice James Parker opened a print shop in 1784, and began working with radical publisher Joseph Johnson. Johnson's house was a meeting-place for some leading English intellectual dissidents of the time: theologian and scientist Joseph Priestley, philosopher Richard Price, artist John Henry Fuseli, early feminist Mary Wollstonecraft and English-American revolutionary Thomas Paine. Along

Figure 2.3: **William Blake in a portrait by Thomas Phillips.**

with William Wordsworth and William Godwin, Blake had great hopes for the French and American revolutions,but despaired with the rise of Robespierre and the Reign of Terror in France.

Blake illustrated *Original Stories from Real Life* (2nd edition, 1791) by Mary Wollstonecraft. They seem to have shared some views on sexual equality and the institution of marriage. In 1793 Blake published *Visions of the Daughters of Albion*, in which he condemned the cruel absurdity of enforced marriage without love and defended the right of women to complete self-fulfilment.

Some verses from Blake's *Auguries of Innocence*

To see a World in a Grain of Sand
And a Heaven in a Wild Flower

Hold Infinity in the palm of your hand
And Eternity in an hour

A Robin Red breast in a Cage
Puts all Heaven in a Rage

A Dove house filled with Doves & Pigeons
Shudders Hell thr' all its regions

A dog starvd at his Masters Gate
Predicts the ruin of the State

A Horse misusd upon the Road
Calls to Heaven for Human blood

Each outcry of the hunted Hare
A fibre from the Brain does tear

A Skylark wounded in the wing
A Cherubim does cease to sing

The Game Cock clipd & armd for fight
Does the Rising Sun affright

Every Wolfs & Lions howl
Raises from Hell a Human Soul

The wild deer, wandring here & there
Keeps the Human Soul from Care

The Lamb misusd breeds Public Strife
And yet forgives the Butchers knife

The Bat that flits at close of Eve
Has left the Brain that wont Believe

The Owl that calls upon the Night
Speaks the Unbelievers fright

He who shall hurt the little Wren
Shall never be belovd by Men

He who the Ox to wrath has moved
Shall never be by Woman loved

The wanton Boy that kills the Fly
Shall feel the Spiders enmity

He who torments the Chafers Sprite
Weaves a Bower in endless Night

The Catterpiller on the Leaf
Repeats to thee thy Mothers grief

Kill not the Moth nor Butterfly
For the Last Judgment draweth nigh

He who shall train the Horse to War
Shall never pass the Polar Bar

The Beggars Dog & Widows Cat
Feed them & thou wilt grow fat

The Gnat that sings his Summers Song
Poison gets from Slanders tongue

The poison of the Snake & Newt
Is the sweat of Envys Foot

The poison of the Honey Bee
Is the Artists Jealousy

The Princes Robes & Beggars Rags
Are Toadstools on the Misers Bags

A Truth thats told with bad intent
Beats all the Lies you can invent

The Whore & Gambler by the State
Licencd build that Nations Fate

The Harlots cry from Street to Street
Shall weave Old Englands winding Sheet

The Winners Shout the Losers Curse
Dance before dead Englands Hearse

Every Night & every Morn
Some to Misery are Born
Every Morn and every Night
Some are Born to sweet delight
Some are Born to sweet delight
Some are Born to Endless Night.

Jerusalem

And did those feet in ancient time
Walk upon England's mountains green?
And was the holy Lamb of God
On England's pleasant pastures seen?

And did the Countenance Divine
Shine forth upon our clouded hills?
And was Jerusalem builded here
Among these dark Satanic Mills?

Bring me my bow of burning gold!
Bring me my arrows of desire!
Bring me my spear! O clouds, unfold!
Bring me my chariot of fire!

I will not cease from mental fight,
Nor shall my sword sleep in my hand,
Till we have built Jerusalem
In England's green and pleasant land.

London

I wandered through each chartered street
Near which the chartered Thames doth flow.
A mark in every face I meet,
Marks of weakness, marks of woe.

In every cry of every man,
In every infant's cry of fear,

In every voice, in every ban,
The mind-forged manacles I hear.

How the chimney-sweeper's cry
Every blackening church appalls,
And how the hapless soldier's sigh
Runs in blood down palace-walls.

But most, through midnight streets I hear
How the youthful harlot's curse
Blasts the new-born infant's tear,
And blights with plagues the marriage-hearse.

Chapter 3

GODWIN

3.1 Godwin's *Political Justice*

In 1793 the English novelist and philosopher William Godwin published an enormously optimistic book, *Political Justice*. As the eighteenth century neared its end, this book became the focus of hopes for political reform and the center of the debate on human progress. Godwin was lifted briefly to enormous heights of fame and adulation, from which he plunged, a few years later, into relative obscurity.

In *Political Justice*, Godwin predicted a future society where scientific progress would liberate humans from material want. Godwin predicted that in the future, with the institution of war abolished, with a more equal distribution of property, and with the help of scientific improvements in agriculture and industry, much less labour would be needed to support life. Luxuries are at present used to maintain artificial distinctions between the classes of society, Godwin wrote, but in the future values will change; humans will live more simply, and their efforts will be devoted to self-fulfillment and to intellectual and moral improvement, rather than to material possessions. With the help of automated agriculture, the citizens of a future society will need only a few hours a day to earn their bread.

Godwin went on to say, "The spirit of oppression, the spirit of servility and the spirit of fraud - these are the immediate growth of the established administration of property. They are alike hostile to intellectual improvement. The other vices of envy , malice, and revenge are their inseparable companions. In a state of society where men lived in the midst of plenty, and where all shared alike the bounties of nature, these sentiments would inevitably expire. The narrow principle of selfishness would vanish. No man being obliged to guard his little store, or provide with anxiety and pain for his restless wants, each would lose his own individual existence in the thought of the general good. No man would be the enemy of his neighbor, for they would have nothing to contend; and of consequence philanthropy would resume the empire which reason assigns her. Mind would be delivered from her perpetual anxiety about corporal support, and free to expatiate in the field of thought which is congenial to her. Each man would assist the inquiries of all."

Godwin insisted that there is an indissoluble link between politics, ethics and knowledge. *Political Justice* is an enthusiastic vision of what humans could be like at some future period when the trend towards moral and intellectual improvement has lifted men and women above their their present state of ignorance and vice. Much of the savage structure of the penal system would then be unnecessary, Godwin believed. (At the time when he was writing, there were more than a hundred capital offenses in England, and this number had soon increased to almost two hundred. The theft of any object of greater value than ten shillings was punishable by hanging.)

In its present state, Godwin wrote, society decrees that the majority of its citizens "should be kept in abject penury, rendered stupid with ignorance and disgustful with vice, perpetuated in nakedness and hunger, goaded to the commission of crimes, and made victims to the merciless laws which the rich have instituted to oppress them". But human behavior is produced by environment and education, Godwin pointed out. If the conditions of upbringing were improved, behavior would also improve. In fact, Godwin believed that men and women are subject to natural laws no less than the planets of Newton's solar system. "In the life of every human", Godwin wrote, "there is a chain of causes, generated in that eternity which preceded his birth, and going on in regular procession through the whole period of his existence, in consequence of which it was impossible for him to act in any instance otherwise than he has acted."

The chain of causality in human affairs implies that vice and crime should be regarded with the same attitude with which we regard disease. The causes of poverty, ignorance, vice and crime should be removed. Human failings should be cured rather than punished. With this in mind, Godwin wrote, "our disapprobation of vice will be of the same nature as our disapprobation of an infectious distemper."

With improved environment and education, humans will reach a higher moral level. But what is morality? Here Godwin draws heavily on his Christian background, especially on the moral principles of the Dissenting community. The Parable of the Good Samaritan illustrates the central principle of Christian ethics: We must love our neighbor as much as we love ourselves; but our neighbor is not necessarily a member of our immediate circle. He or she may be distant from us, in culture, in ethnic background or in geographical distance. Nevertheless, that person is still our neighbor, a member of the human family, and our duty to him or her is no less than our duty to those who are closest to us. It follows that narrow loyalties must be replaced or supplemented by loyalty to the interests of humanity as a whole.

Judging the benevolence of our actions is the responsibility of each individual conscience, Godwin says, not the responsibility of the State, and the individual must follow his or her conscience even if it conflicts with the dictates of the State. Each individual case should be judged by itself. If our institutions and laws meet the criteria of benevolence, justice and truth, we should give them our enthusiastic support; if not, we should struggle to change them. In giving personal judgement such a dominant role, Godwin anticipates the ideas of Thoreau, Tolstoy and Gandhi.

The exercise of individual judgement requires great honesty and objectivity. In order for the power of truth and reason to overcome prejudice and error, Godwin says, it is

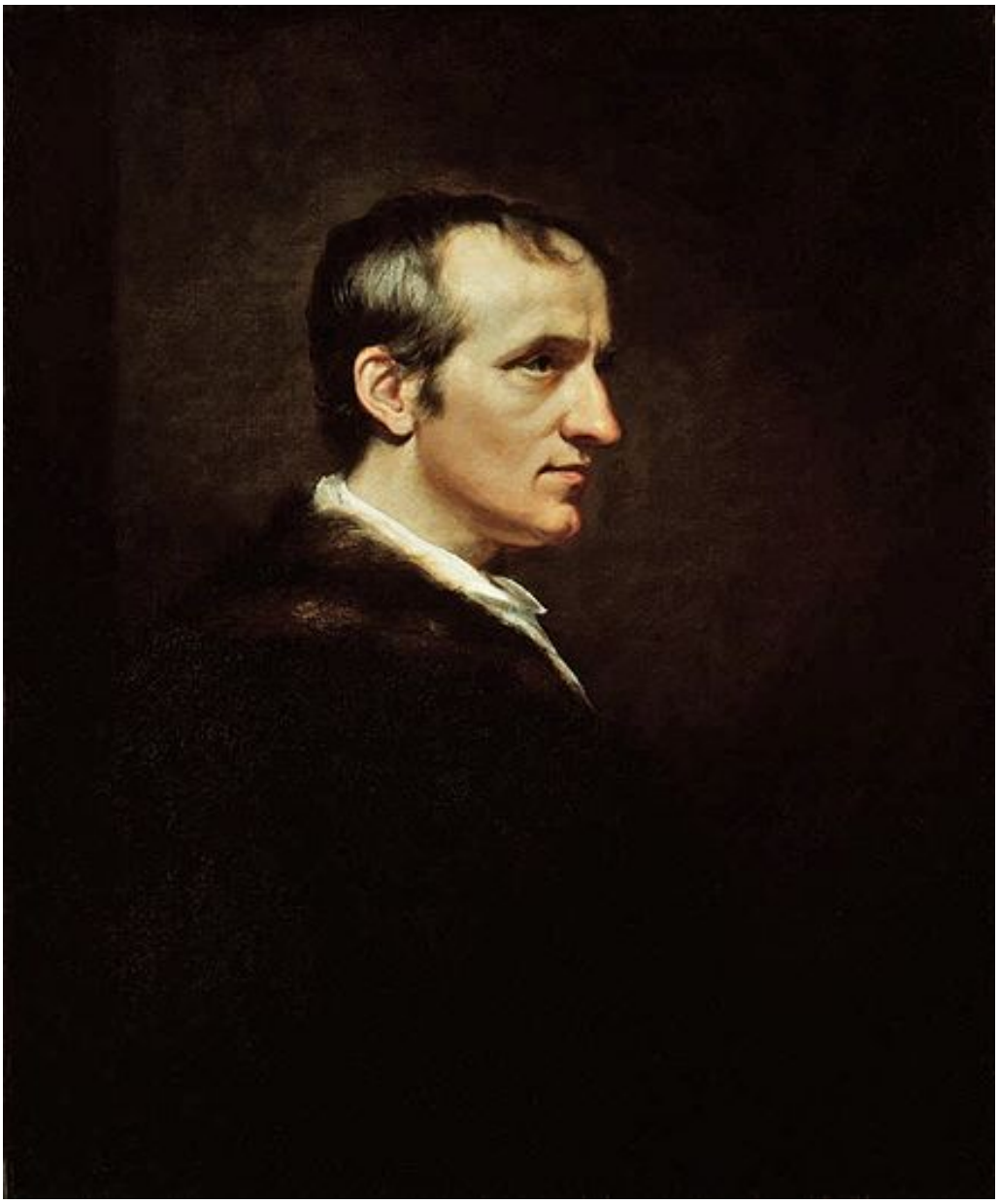


Figure 3.1: **William Godwin in a painting by James Northcote (Wikipedia).**

necessary for each person always to speak and act with complete sincerity. Even the degree of insincerity necessary for elegant manners is wrong in Godwin's opinion.

Starting with these ethical principles, Godwin proceeds with almost mathematical logic to deduce the consequences, intoxicated by his enthusiasm and not stopping even when the conclusions to which he is driven conflict with conventional wisdom and intuitio.n. For example, he denies that humans have rights and maintains that they only have duties.

Regarding the right to dispose of private property as one chooses, Godwin says: "To whom does any article, suppose a loaf of bread, justly belong? I have an hundred loaves in my possession, and in the next street there is a poor man expiring with hunger, to whom one of these loaves would be a means of preserving his life. If I withhold this loaf from him, am I not unjust? If I impart it, am I not complying with what justice demands?"

In other words, according to Godwin, our duty to act for the benefit of humanity implies a sacrifice of our private rights as individuals. Private property is not really our own, to be used as we wish; it is held in trust, to be used where it will do the greatest amount of good for humanity as a whole.

Godwin also denies that several commonly admired virtues really are virtues. Keeping promises, he says, is not a virtue because at any given moment we have a duty to do the greatest possible good through our actions. If an act is good, we should do it because we believe it to be good, not because we have promised to do it; and a promise should not force us to perform an act which we believe to be bad. A virtuous person therefore does not make promises. Similarly, Godwin maintains that gratitude is a vice since it distorts our judgement of the benevolence of our actions. When he heard of Godwin's doctrine on gratitude, Edmund Burke remarked "I would save him from that vice by not doing him any service!"

Godwin saw the system of promises, loyalty, and gratitude as a means by which individual judgement can be suspended and tyranny maintained. People can be forced to act against their consciences because of promises which they have made or services which they have received. An example of this is the suspension of private ethical judgement which follows a soldier's induction into an army. We should perform an act, Godwin maintains, not because of fear of punishment or hope of reward or in return for favors that we have received, but rather because we believe the act to be of the highest benefit to humanity as a whole.

Many of our political institutions may be needed now, Godwin said, because of mankind's present faults; but in the future, when humanity has reached a higher level of perfection, they will be needed less and less. The system of nation states might then be replaced by a loose federation of small communities, within each of which problems could be resolved by face-to-face discussion. Regarding this future ideal system, Godwin writes: "It is earnestly to be desired that each man was wise enough to govern himself without the interference of any compulsory restraint; and since government in its best state is an evil, the object principally to be aimed at is, that we should have as little of it as the general peace of human society will permit."

Political Justice is a vision or prophesy of what human life might be like, not in the world as it is but in an ideal world of the future. As Godwin's disciple, Percy Bysshe

Shelley, later expressed it in his verse-drama *Prometheus Unbound*,

The loathsome mask has fallen, the man remains
Sceptreless, free, uncircumscribed, but man
Equal, unclassed, tribeless, and nationless,
Exempt from awe, worship, degree, the king
Over himself; just, gentle, wise...

3.2 Enormous instant fame; The New Philosophy

The quarto edition of *Political Justice* was a best seller and the book was soon republished in a less expensive octavo edition which sold equally well. It was pirated in Ireland, Scotland, and America and hundreds of groups of workers who could not afford to buy the book individually bought joint copies, which then circulated among the subscribers or were read aloud to groups. The doctrines advocated in *Political Justice* were soon being called the "New Philosophy".

Godwin became famous overnight: "I was nowhere a stranger', he wrote later, "...I was everywhere received with curiosity and kindness. If temporary fame ever was an object worthy to be coveted by the human mind, I certainly obtained it in a degree that has seldom been exceeded."

Godwin's friend, the essayist William Hazlitt, described this sudden burst of fame in the following words: "... he blazed as a sun in the firmament of reputation; no-one was more talked of, more looked up to, more sought after, and wherever liberty, truth, justice was the theme, his name was not far off".

William Wordsworth read *Political Justice* in 1794 and was greatly influenced by it. Between February and August 1795, Wordsworth met Godwin seven times for long private discussions. Much of Wordsworth's writing from the Great Decade shows the mark of Godwin's ideas, as can be seen, for example in the following lines from *The Prelude*S:

How glorious! in self-knowledge and self-rule,
To look through all the frailties of the world,
And, with a resolute mastery shaking off
Infirmities of nature, time and place,
Build social upon personal Liberty,
Which, to the blind restraints of general laws
Superior, magisterially adopts
One guide, the light of circumstances, flashed
Upon an independent intellect

3.3 *Things as they are*

On 26 May 1794, Godwin added to his already great reputation by publishing a powerful and original psychological novel, *Things as They Are*, later renamed *Caleb Williams*. Godwin's purpose in writing this novel was to illustrate some of the themes of *Political Justice* and to bring his ideas to readers who might not be directly interested in philosophy.

In *Caleb Williams*, Godwin makes several literary innovations which were to influence such writers as Edgar Allan Poe, Charles Dickens, Balzac, and Victor Hugo. *Caleb Williams* is, in fact, the ancestor of the modern thriller and detective story.

3.4 A few hangings needed to cast a chill over discussion

Godwin had written a Preface to *Caleb Williams* in which he said: "The question now afloat in the world respecting THINGS AS THEY ARE, is the most interesting which can be presented to the human mind. While one party pleads for reformation and change, the other extols in the warmest terms the existing constitution of society... It is now known to philosophers that the spirit and character of a government intrudes itself into every rank of society. But this is a truth highly worthy to be communicated to persons whom books of philosophy and science are never likely to reach. Accordingly it was proposed in the invention of the following work, to comprehend, as far as the progressive nature of a single story would allow, a general review of the modes of domestic and unrecorded tyranny." .

This Preface was never printed, because Godwin's publisher, Crosby, was afraid of prosecution. In fact, the publication of *Caleb Williams* coincided with a decision by Pitt's government that a few hangings were needed in order to cast a chill on public discussion of political reform. On the day of publication, orders went out for the arrest of Godwin's friends in the reform movement, Hardy, Thelwall, and Horne Tooke. Although the radical leaders were arrested in May, *habeas corpus* was suspended, and it was not until 2 October 1794 that a charge was brought against them. A few days later, on a trip to Warwickshire, Godwin heard that his closest friend, Thomas Holcroft, also had been arrested.

Godwin hurried back to London and locked himself in his home, studying the charges that had been brought by Lord Chief Justice Eyre against Holcroft and the others. The charge was high treason and the law under which Eyre brought this charge had been passed in the fourteenth century, during the reign of Edward III. It defined high treason as any act which could "compass or imagine the Death of a King". The penalty for this offense was to be hanged by the neck, to be cut down while still living, to be disembowelled, to have one's bowels burnt before one's eyes, and then to be beheaded and quartered. It was rumored that as soon as the 12 prisoners were convicted, 800 further arrest warrants were ready to go out and Godwin's own name might well have been among them.

Godwin soon saw that Eyre's argument involved an unprecedented broadening of the definition of high treason. Essentially Eyre was arguing that the actions of the accused might cause events in England to follow the same course as in France, where Louis XVI

had recently been executed. On 21 October Godwin published an anonymous article in the Morning Chronicle entitled *Cursory Strictures on the Charge Delivered by Lord Chief Justice Eyre*. It was a carefully written legal argument, completely different in style from anything that Godwin had written previously. In this article, he argued that in broadening the interpretation of high treason without precedent, Eyre was in effect creating a new law and judging the prisoners *ex post facto*. It was especially necessary for high treason to have a narrow definition, Godwin pointed out, since a broad definition could lead to the abridgement of all English civil liberties.

After the publication of *Cursory Strictures* it became clear to everyone that Eyre's charge lay outside the boundary of the law and that it would probably not be upheld. Nevertheless, the atmosphere in the courtroom was tense as the jury returned its verdicts. As soon as Holcroft was acquitted, he left the dock and went to sit beside Godwin. The artist, Sir Thomas Lawrence, made a sketch of the two friends sitting side-by-side and waiting for the verdict on the other prisoners, Godwin's bending and contemplative figure contrasting with Holcroft's upright and defiant stance. In the end, all charges were dropped.

3.5 William and Mary

Soon after these dramatic events, William Godwin met Mary Wollstonecraft for a second time. On 8 January 1796, Mary Hayes, a friend and admirer of Mary Wollstonecraft, invited her to tea together with William Godwin and Thomas Holcroft. The tea was a success, and Godwin found Mary Wollstonecraft very much changed from the carelessly dressed and irritating woman who had dominated the conversation at Johnson's dinner when he had wanted to hear Thomas Paine. Now, several years later, she had become much more attractive. Mary's beauty and her charming, intelligent conversation won Godwin's heart. He also greatly admired her recently published book, *Letters Written during a Short Residence in Sweden, Norway and Denmark*.

On 13 February, Godwin called on Mary Wollstonecraft, but she was not at home. On 14 April, she broke the social rules of the time and returned his call. During the next few months they often appeared together at literary and artistic dinners in London. They had many friends in common and both of them had many admirers of the opposite sex. Godwin was not a tall man and his nose was rather large. On the other hand, he had fine eyes and a high, impressive brow; his manners had become more gallant and fame is a powerful aphrodisiac. A number of attractive intellectual women fluttered around him. Mary's admirers included the poet Robert Southey, the distinguished artist John Opie, and Godwin's closest friend, Thomas Holcroft.

Gradually, during the spring and summer of 1796, the friendship between Mary Wollstonecraft and William Godwin deepened into love. Outwardly, nothing was changed. Both partners were hard at work, Godwin preparing a new edition of *Political Justice* and Mary writing a novel, *The Wrongs of Woman*. Like *Caleb Williams*, Mary's novel was designed to illustrate the themes of the New Philosophy. They kept their relationship a secret, continued to live separately, and continued to meet their friends as before, but they

had become lovers. For Godwin, this was the first real love affair of his life and he was at first very awkward, afraid of the strong emotions he was experiencing. Mary tenderly and good-humouredly guided him through his difficulties.

As winter approached, a crisis occurred: Johnson, Mary's publisher insisted that she should settle her debts and refused to give her more credit. At the same time, Mary realized that she was pregnant. She had experienced some of the harsh penalties with which English society of that time punished unwed mothers. Many of her former friends had dropped away. Her remaining friends called her Mrs Imlay, maintaining the fiction that she had been legally married; but with the new baby no such cover would be possible. Johnson offered a solution: He knew of a rich but somewhat elderly admirer who was willing to solve all of Mary's problems, both financial and social, by marrying her. Mary felt insulted and would not hear of this solution. In her books she had often denounced marriage for the sake of property as "legalized prostitution". Instead, she asked Godwin to marry her. He did this in spite of his own disapproval of the institution of marriage as practised at that time in Europe, an institution which he had called "the most odious of all monopolies".

Godwin and Mary were in fact extremely happy together. They were not at all alike: He relied on reason, while she placed more trust in her emotions. These differences meant that each revealed a new world for the other. For Godwin, Mary opened a world of strong feelings; and he acquired from her a taste for the writings of Rousseau, whom she called "the Prometheus of Sentiment". Godwin was never the same again. All his later novels and books of philosophy were to stress the importance of domestic affections and sensitivity to the force of emotion.

3.6 Mary's tragic death in childbirth

Mary's baby was due at the end of August 1797. She insisted that no doctor was needed, only a midwife. After a long labour, she gave birth to a baby girl at 11 p.m. and Godwin was overjoyed that all had gone well. However, at 2 a.m. the midwife warned Godwin that his wife was still in danger, since the afterbirth had not yet appeared. A doctor was sent for; and following the accepted medical practice of the time, he removed the afterbirth surgically. Mary at first seemed to be recovering well; but in a few days it became clear that she was fatally ill with an infection, very likely the result of the operation to remove the afterbirth. On 10 September she died, brave and affectionate to the end. In her last words, she spoke of Godwin as "the kindest, best man in the world".

Godwin was left heartbroken by Mary's death. In a letter to Holcroft he wrote: "My wife is now dead. I firmly believe that there does not exist her equal in the world. I know from experience that we were formed to make each other happy. I have not the least expectation that I can now ever know happiness again". In his sorrow, he sat rereading Mary's books and letters, seeming to hear her voice again through the words that she had written.

Soon Godwin found consolation for his grief by editing the unpublished works of his

dead wife and by writing her biography. Believing strongly in the principle of absolute honesty, he tried to describe her life and work as simply and as accurately as he could, not hiding her human weaknesses, but at the same time doing full justice to her stature as a great pioneer of woman's rights. He included her letters to Imlay, and a description of an affair between Mary and the Swiss artist Fuseli, which had taken place before her departure for France.

On 29 January 1798, Johnson published Godwin's *Memoirs of the Author of the Vindication of the Rights of Woman*, together with four small volumes of Mary's posthumous works, including her unfinished novel, *The Wrongs of Woman*.

3.7 The wave of hope crashes down

Godwin's moving and honest portrait of his wife is one of his most enduring and readable books but its honesty shocked his contemporaries more than anything else that he had written. The European Magazine, for example, said that it would be read "with disgust by every female who has any pretensions to delicacy; with detestation by everyone attached to the interests of religion and morality; and with indignation by any one who might feel any regard for the unhappy woman, whose frailties should have been buried in oblivion".

This reaction against the *Memoirs* was part of a much more general reaction against all liberal ideas. In 1798, Napoleon's armies were victorious on the continent, and the French were massing their forces for an invasion of England. Napoleon believed that the ordinary people of England would welcome him as a liberator and, in fact, the English government was facing a mutiny in its own navy, massive riots, and rebellion in Ireland. The Establishment was fighting for its life and was not in the mood to make fine distinctions about whether the blows that it struck were above or below the belt. Pitt and Grenville had already introduced the "Gagging Acts", which effectively put an end to freedom of speech and assembly. The government now sponsored, by means of a secret subsidy, the *Anti-Jacobin Review*, a periodical which savagely attacked all of the leading liberals in turn, including both William and Mary.

Godwin had been carried to great heights by the wave of hope which accompanied the French Revolution; and as the wave crashed he was carried down with it. Despite the abuse and ridicule which were increasingly heaped upon him, he maintained a philosophical attitude, confident that he had already made a permanent contribution to the idea of human progress. His ideas, and those of his pioneering wife Mary Wollstonecraft, can speak to our present dangerous situation.

Chapter 4

CONDORCET

4.1 Condorcet: A vision of human progress

In France the Marquis de Condorcet had written an equally optimistic book, *Esquisse d'un Tableau Historique des Progrès de l'Esprit Humain*. Condorcet's optimism was unaffected even by the fact that at the time when he was writing he was in hiding, under sentence of death by Robespierre's government. Like Godwin's *Political Justice*, this book offers an optimistic vision of of how human society can be improved. Together, the two books provoked Malthus to write his book on population.

4.2 Condorcet becomes a mathematician

Marie-Jean-Antoine-Nicolas Caritat, Marquis de Condorcet, was born in 1743 in the town of Ribemont in southern France. He was born into an ancient and noble family of the principality of Orange but there was nothing in his background to suggest that he might one day become a famous scientist and social philosopher. In fact, for several generations before, most of the men in the family had followed military or ecclesiastical careers and none were scholars.

After an initial education received at home from his mother, Condorcet was sent to his uncle, the Bishop of Lisieux, who provided a Jesuit tutor for the boy. In 1758 Condorcet continued his studies with the Jesuits at the College of Navarre. After he graduated from the College, Condorcet's powerful and independent intelligence suddenly asserted itself. He announced that he intended to study mathematics. His family was unanimously and violently opposed to this idea. The privileges of the nobility were based on hereditary power and on a static society. Science, with its emphasis on individual talent and on progress, undermined both these principles. The opposition of Condorcet's family is therefore understandable but he persisted until they gave in.

From 1765 to 1774, Condorcet focused on science. In 1765, he published his first work on mathematics entitled *Essai sur le calcul intégral*, which was well received, launching his career as a mathematician. He would go on to publish many more papers, and in 1769, at

the age of 26, he was elected to the Academie royale des Sciences (French Royal Academy of Sciences)

Condorcet worked with Leonhard Euler and Benjamin Franklin. He soon became an honorary member of many foreign academies and philosophic societies including the Royal Swedish Academy of Sciences (1785), Foreign Honorary Member of the American Academy of Arts and Sciences (1792), and also in Prussia and Russia.

4.3 Human rights and scientific sociology

In 1774, at the age of 31, Condorcet was appointed Inspector-General of the Paris Mint by his friend, the economist Turgot. From this point on, Condorcet shifted his focus from the purely mathematical to philosophy and political matters. In the following years, he took up the defense of human rights in general, and of women's and blacks' rights in particular (an abolitionist, he became active in the Society of the Friends of the Blacks in the 1780s). He supported the ideals embodied by the newly formed United States, and proposed projects of political, administrative and economic reforms intended to transform France.

The year 1785 saw the publication of Condorcet's highly original mathematical work, *Essai sur l'application de l'analyse à la probabilité des décisions rendues à la pluralité des voix*, in which he pioneered the application of the theory of probability in the social sciences. A later, much enlarged, edition of this book extended the applications to games of chance. Through these highly original works, Condorcet became a pioneer of scientific sociology.

In 1786, Condorcet married one of the most beautiful women of the time, Sophie de Grouchy (1764-1822). Condorcet's position as Inspector-General of the Mint meant that they lived at the Hotel des Monnaies. Mme Condorcet's salon there was famous.

Figure 4.1: **The Marquis de Condorcet (public domain).**

4.4 The French Revolution

Ever since the age of 17, Condorcet had thought about questions of justice and virtue and especially about how it is in our own interest to be both just and virtuous. Very early in his life he had been occupied with the idea of human perfectibility. He was convinced that the primary duty of every person is to contribute as much as possible to the development of mankind, and that by making such a contribution, one can also achieve the greatest possible personal happiness. When the French Revolution broke out in 1789 he saw it as an unprecedented opportunity to do his part in the cause of progress and he entered the arena wholeheartedly.

Condorcet was first elected as a member of the Municipality of Paris; and then, in 1791, he became one of the six Commissioners of the Treasury. Soon afterwards he was elected to the Legislative Assembly, of which he became first the Secretary and finally the President. In 1792, Condorcet proposed to the Assembly that all patents of nobility should be burned. The motion was carried unanimously; and on 19 June his own documents were thrown on a fire with the others at the foot of a statue of Louis XIV.

Condorcet was one of the chief authors of the proclamation which declared France to be a republic and which summoned a National Convention. As he remained above the personal political quarrels that were raging at the time, Condorcet was elected to the National Convention by five different constituencies. When the Convention brought Louis XVI to trial, Condorcet maintained that, according to the constitution, the monarch was inviolable and that the Convention therefore had no legal right to try the King. When the King was tried despite these protests, Condorcet voted in favor of an appeal to the people.

4.5 Drafting a new constitution for France

In October 1792, when the Convention set up a Committee of Nine to draft a new constitution for France, Condorcet sat on this committee as did the Englishman, Thomas Paine. Under sentence of death in England for publishing his pamphlet *The Rights of Man*, Paine had fled to France and had become a French citizen. He and Condorcet were the chief authors of a moderate (Gerondist) draft of the constitution. However, the Jacobin leader, Robespierre, bitterly resented being excluded from the Committee of Nine and, when the Convention then gave the responsibility for drafting the new constitution to the Committee for Public Safety, which was enlarged for this purpose by five additional members. The result was a hastily produced document with many glaring defects. When it was presented to the Convention, however, it was accepted almost without discussion. This was too much for Condorcet to stomach and he published anonymously a letter entitled Advice to the French on the New Constitution, in which he exposed the defects of the Jacobin constitution and urged all Frenchmen to reject it.

4.6 Hiding from Robespierre's Terror

Condorcet's authorship of this letter was discovered and treated as an act of treason. On 8 July 1793, Condorcet was denounced in the Convention; and an order was sent out for his arrest. The officers tried to find him, first at his town house and then at his house in the country but, warned by a friend, Condorcet had gone into hiding.

The house where Condorcet took refuge was at Rue Servandoni, a small street in Paris leading down to the Luxembourg Gardens, and it was owned by Madame Vernet, the widow of a sculptor. Madame Vernet, who sometimes kept lodgings for students, had been asked by Condorcet's friends whether she would be willing to shelter a proscribed man. 'Is he a good man?', she had asked; and when assured that this was the case, she had said, 'Then let him come at once. You can tell me his name later. Don't waste even a moment. While we are speaking, he may be arrested.' She did not hesitate, although she knew that she risked death, the penalty imposed by the Convention for sheltering a proscribed man.

4.7 Condorcet writes the *Esquisse*

Although Robespierre's agents had been unable to arrest him, Condorcet was sentenced to the guillotine *in absentia*. He knew that in all probability he had only a few weeks or months to live and he began to write his last thoughts, racing against time. Hidden in the house at Rue Servandoni, and cared for by Madame Vernet, Condorcet returned to a project which he had begun in 1772, a history of the progress of human thought, stretching from the remote past to the distant future. Guessing that he would not have time to complete the full-scale work he had once planned, he began a sketch or outline: *Esquisse d'un Tableau Historique des progrés de l'Esprit Humain.*

Condorcet's *Esquisse*, is an enthusiastic endorsement of the idea of infinite human perfectibility which was current among the philosophers of the 18th century, and in this book, Condorcet anticipated many of the evolutionary ideas of Charles Darwin. He compared humans with animals, and found many common traits. Condorcet believed that animals are able to think, and even to think rationally, although their thoughts are extremely simple compared with those of humans. He also asserted that humans historically began their existence on the same level as animals and gradually developed to their present state.

Since this evolution took place historically, he reasoned, it is probable, or even inevitable, that a similar evolution in the future will bring mankind to a level of physical, mental and moral development which will be as superior to our own present state as we are now superior to animals.

In his *Esquisse*, Condorcet called attention to the unusually long period of dependency which characterize the growth and education of human offspring. This prolonged childhood is unique among living beings. It is needed for the high level of mental development of the human species; but it requires a stable family structure to protect the young during their long upbringing. Thus, according to Condorcet, biological evolution brought into existence a moral precept, the sanctity of the family.

Similarly, Condorcet maintained, larger associations of humans would have been impossible without some degree of altruism and sensitivity to the suffering of others incorporated into human behavior, either as instincts or as moral precepts or both; and thus the evolution of organized society entailed the development of sensibility and morality.

Condorcet believed that ignorance and error are responsible for vice; and he listed what he regarded as the main mistakes of civilization: hereditary transmission of power, inequality between men and women, religious bigotry, disease, war, slavery, economic inequality, and the division of humanity into mutually exclusive linguistic groups.

Condorcet believed the hereditary transmission of power to be the source of much of the tyranny under which humans suffer; and he looked forward to an era when republican governments would be established throughout the world. Turning to the inequality between men and women, Condorcet wrote that he could see no moral, physical or intellectual basis for it. He called for complete social, legal, and educational equality between the sexes.

Condorcet predicted that the progress of medical science would free humans from the worst ravages of disease. Furthermore, he maintained that since perfectibility (i.e. evolution) operates throughout the biological world, there is no reason why mankind's physical structure might not gradually improve, with the result that human life in the remote future could be greatly prolonged. Condorcet believed that the intellectual and moral facilities of man are capable of continuous and steady improvement; and he thought that one of the most important results of this improvement will be the abolition of war.

At the end of his *Esquisse*, Condorcet said that any person who has contributed to the progress of mankind to the best of his ability becomes immune to personal disaster and suffering. He knows that human progress is inevitable and can take comfort and courage from his inner picture of the epic march of mankind, through history, towards a better future.

Shortly after Condorcet completed the *Esquisse*, he received a mysterious warning that soldiers of the Convention were on their way to inspect Madame Vernet's house. Wishing to spare his generous hostess from danger, he disguised himself as well as he could and slipped past the portress. However, Condorcet had only gone a few steps outside the house when he was recognized by Madame Verdet's cousin, who risked his life to guide Condorcet past the sentinels at the gates of Paris, and into the open country beyond.

Condorcet wandered for several days without food or shelter, hiding himself in quarries and thickets. Finally, on 27 March 1794, hunger forced him to enter a tavern at the village of Clamart, where he ordered an omelette. When asked how many eggs it should contain, the exhausted and starving philosopher replied without thinking, 'twelve'. This reply, together with his appearance, excited suspicion. He was asked for his papers and, when it was found that he had none, soldiers were sent for and he was arrested. He was taken to a prison at Bourg-la-Reine, but he was so weak that he was unable to walk there, and had to be carried in a cart. The next morning, Condorcet was found dead on the floor of his cell. The cause of his death is not known with certainty. It was listed in official documents as congestion sanguine, congestion of the blood but the real cause may have been cold, hunger, exhaustion or poison. Many historians believe that Condorcet was murdered by Robespierre's agents, since he was so popular that a public execution would have been

impossible.

After Condorcet's death the currents of revolutionary politics shifted direction. Robespierre, the leader of the Terror, was himself soon arrested. The execution of Robespierre took place on 25 July 1794, only a few months after the death of Condorcet.

Condorcet's *Esquisse d'un Tableau Historique des Progrès de l'Esprit Humain* was published posthumously in 1795. In the post-Thermidor reconstruction, the Convention voted funds to have it printed in a large edition and distributed throughout France, thus adopting the *Esquisse* as its official manifesto. Condorcet's name will always be linked with this small prophetic book. It was destined to establish the form in which the eighteenth-century idea of progress was incorporated into Western thought, and (as was mentioned in Chapter 1) it provoked Robert Malthus to write *An Essay on the Principle of Population.*

4.8 Condorcet's *On the Admission of Women to the Rights of Citizenship (1790)*

Custom may familiarise mankind with the extent, that even among those who have violation of their natural rights to such an lost or been deprived of these rights, no one thinks of reclaiming them, or is even conscious that they have suffered any injustice.

Certain of these violations (of natural right) have escaped the notice of philosophers and legislators, even while concerning themselves zealously to establish the common rights of individuals of the human race, and in this way to lay the foundation of political institutions. For example, have they not all violated the principle of the equality of rights in tranquilly depriving one-half of the human race of the right of taking part in the formation of laws by the exclusion of women from the rights of citizenship? Could there be a stronger proof of the power of habit, even among enlightened men, than to hear invoked the principle of equal rights in favour of perhaps some 300 or 400 men, who had been deprived of it by an absurd prejudice, and forget it when it concerns some 12,000,000 women?

To show that this exclusion is not an act of tyranny, it must be proved either that the natural rights of women are not absolutely the same as those of men, or that women are not capable of exercising these rights.

But the rights of men result simply from the fact that they are rational, sentient beings, susceptible of acquiring ideas of morality, and of reasoning concerning those ideas. Women having, then, the same qualities, have necessarily the same rights. Either no individual of the human species has any true rights, or all have the same; and he or she who votes against the [6] rights of another, whatever may be his or her religion, colour, or sex, has by that fact abjured his own.

It would be difficult to prove that women are incapable of exercising the rights of citizenship. Although liable to become mothers of families, and exposed to other passing indispositions, why may they not exercise rights of which it has never been proposed to deprive those persons who periodically suffer from gout, bronchitis, etc.? Admitting for the moment that there exists in men a superiority of mind, which is not the necessary result of

a difference of education (which is by no means proved, but which should be, to permit of women being deprived of a natural right without injustice), this inferiority can only consist in two points. It is said that no woman has made any important discovery in science, or has given any proofs of the possession of genius in arts, literature, etc.; but, on the other hand, it is not pretended that the rights of citizenship should be accorded only to men of genius. It is added that no woman has the same extent of knowledge, the same power of reasoning, as certain men; but what results from that? Only this, that with the exception of a limited number of exceptionally enlightened men, equality is absolute between women and the remainder of the men; that this small class apart, inferiority and superiority are equally divided between the two sexes. But since it would be completely absurd to restrict to this superior class the rights of citizenship and the power of being entrusted with public functions, why should women be excluded any more than those men who are inferior to a great number of women? Lastly, shall it be said that there exists in the minds and hearts of women certain qualities which ought to exclude them from the enjoyment of their natural rights? Let us interrogate the facts. Elizabeth of England, Maria Theresa, the two Catherines of Russia - have they not shown that neither in courage nor in strength of mind are women wanting?

Elizabeth possessed all the failings of women. Did these failings work more harm during her reign than resulted from the failings of men during the reign of her father, Henry VIII., or her successor, James I.? Have the lovers of certain empresses exercised a more dangerous influence than the mistresses of Louis XIV., of Louis XV., or even of Henry IV.?

Will it be maintained that Mistress Macaulay would not have expressed her opinions in the House of Commons better than many representatives of the British nation? In dealing with the question of liberty of conscience, would she not have expressed more elevated principles than those of Pitt, as well as more powerful reasoning? Although as great an enthusiast on behalf of liberty as Mr. Burke could be on behalf of its opposite, would she, while defending the French Constitution, have made use of such absurd and offensive nonsense as that which this celebrated rhetorician made use of in attacking it? Would not the adopted daughter of Montaigne have better defended the rights of citizens in France, in 1614, than the Councillor Courtin, who was a believer in magic and occult powers? Was not the Princesse des Ursins superior to Chamillard? Could not the Marquise de Chatelet have written equally as well as M. RouillÃ©? Would Mme. de Lambert have made laws as absurd and as barbarous as those of the "garde des Sceaux," of Armenouville, against Protestants, invaders of domestic privacy, robbers and negroes? In looking back over the list of those who have governed the world, men have scarcely the right to be so very uplifted.

Women are superior to men in the gentle and domestic virtues; they, as well as men, know how to love liberty, although they do not participate in all its advantages; and in republics they have been known to sacrifice themselves for it. They have shown that they possess the virtues of citizens whenever chance or civil disasters have brought them upon a scene from which they have been shut out by the pride and the tyranny of men in all nations.

It has been said that women, in spite of much ability, of much sagacity, and of a power

of reasoning carried to a degree equalling that of subtle dialecticians, yet are never governed by what is called "reason."

This observation is not correct. Women are not governed, it is true, by the reason (and experience) of men; they are governed by their own reason (and experience).

Their interests not being the same (as those of men) by the fault of the law, the same things not having the same importance for them as for men, they may, without failing in rational conduct, govern themselves by different principles, and [8] tend towards a different result. It is as reasonable for a woman to concern herself respecting her personal attractions as it was for Demosthenes to cultivate his voice and his gestures.

It is said that women, although superior in some respects to man - more gentle, more sensitive, less subject to those vices which proceed from egotism and hardness of heart - yet do not really possess the sentiment of justice; that they obey rather their feelings than their conscience. This observation is more correct, but it proves nothing; it is not nature, it is education, it is social existence which produces this difference.

Neither the one nor the other has habituated women to the idea of what is just, but only to the idea of what is "honest", or respectable. Excluded from public affairs, from all those things which are judged of according to rigorous ideas of justice, or according to positive laws, the things with which they are occupied and which are affected by them are precisely those which are regulated by natural feelings of honesty (or, rather, propriety) and of sentiment. It is, then, unjust to allege as an excuse for continuing to refuse to women the enjoyment of all their natural rights motives which have only a kind of reality because women lack the experience which comes from the exercise of these rights.

If reasons such as these are to be admitted against women, it will become necessary to deprive of the rights of citizenship that portion of the people who, devoted to constant labour, can neither acquire knowledge nor exercise their reason; and thus, little by little, only those persons would be permitted to be citizens who had completed a course of legal study. If such principles are admitted, we must, as a natural consequence, renounce the idea of a liberal constitution. The various aristocracies have only had such principles as these for foundation or excuse. The etymology of the word is a sufficient proof of this.

Neither can the subjection of wives to their husbands be alleged against their claims, since it would be possible in the same statute to destroy this tyranny of the civil law. The existence of one injustice can never be accepted as a reason for committing another.

There remain, then, only two objections to discuss. And, in truth, these can only oppose motives of expediency against the admission of [9] women to the right of voting; which motives can never be upheld as a bar to the exercise of true justice. The contrary maxim has only too often served as the pretext and excuse of tyrants; it is in the name of expediency that commerce and industry groan in chains; and that Africa remains afflicted with slavery: it was in the name of public expediency that the Bastille was crowded; that the censorship of the press was instituted; that accused persons were not allowed to communicate with their advisers; that torture was resorted to. Nevertheless, we will discuss these objections, so as to leave nothing without reply.

It is necessary, we are warned, to be on guard against the influence exercised by women over men. We reply at once that this, like any other influence, is much more to be feared

when not exercised openly; and that, whatever influence may be peculiar to women, if exercised upon more than one individual at a time, will in so far become proportionately lessened. That since, up to this time, women have not been admitted in any country to absolute equality; since their empire has none the less existed everywhere; and since the more women have been degraded by the laws, the more dangerous has their influence been; it does not appear that this remedy of subjection ought to inspire us with much confidence. Is it not probable, on the contrary, that their special empire would diminish if women had less interest in its preservation; if it ceased to be for them their sole means of defence, and of escape from persecution?

If politeness does not permit to men to maintain their opinions against women in society, this politeness, it may be said, is near akin to pride; we yield a victory of no importance; defeat does not humiliate when it is regarded as voluntary. Is it seriously believed that it would be the same in a public discussion on an important topic? Does politeness forbid the bringing of an action at law against a woman?

But, it will be said, this change will be contrary to general expediency, because it will take women away from those duties which nature has reserved for them. This objection scarcely appears to me well founded. Whatever form of constitution may be established, it is certain that in the present state of civilisation among European nations there will never be more than a [10] limited number of citizens required to occupy themselves with public affairs. Women will no more be torn from their homes than agricultural labourers from their ploughs, or artisans from their workshops. And, among the richer classes, we nowhere see women giving themselves up so persistently to domestic affairs that we should fear to distract their attention; and a really serious occupation or interest would take them less away than the frivolous pleasures to which idleness, a want of object in life, and an inferior education have condemned them.

The principal source of this fear is the idea that every person admitted to exercise the rights of citizenship immediately aspires to govern others. This may be true to a certain extent, at a time when the constitution is being established, but the feeling can scarcely prove durable. And so it is scarcely necessary to believe that because women may become members of national assemblies, they would immediately abandon their children, their homes, and their needles. They would only be the better fitted to educate their children and to rear men. It is natural that a woman should suckle her infant; that she should watch over its early childhood. Detained in her home by these cares, and less muscular than the man, it is also natural that she should lead a more retired, a more domestic life. The woman, therefore, as well as the man in a corresponding class of life, would be under the necessity of performing certain duties at certain times according to circumstances. This may be a motive for not giving her the preference in an election, but it cannot be a reason for legal exclusion. Gallantry would doubtless lose by the change, but domestic customs would be improved by equality in this as in other things.

Up to this time the manners of all nations have been more or less brutal and corrupt. I only know of one exception, and that is in favour of the Americans of the United States, who are spread, few in number, over a wide territory. Up to this time, among all nations, legal inequality has existed between men and women; and it would not be difficult to show

that, in these two phenomena, the second is one of the causes of the first, because inequality necessarily introduces corruption, and is the most common cause of it, if even it be not the sole cause. [11]

I now demand that opponents should condescend to refute these propositions by other methods than by pleasantries and declamations; above all, that they should show me any natural difference between men and women which may legitimately serve as foundation for the deprivation of a right.

The equality of rights established between men by our new constitution has brought down upon us eloquent declamations and never-ending pleasantries; but up till now no one has been able to oppose to it one single reason, and this is certainly neither from lack of talent nor lack of zeal. I venture to believe that it will be the same with regard to equality of rights between the two sexes. It is sufficiently curious that, in a great number of countries, women have been judged incapable of all public functions yet worthy of royalty; that in France a woman has been able to be regent, and yet that up to 1776 she could not be a milliner or dressmaker ("marchande des modes") in Paris, except under cover of her husband's name; and that, lastly, in our elective assemblies they have accorded to rights of property what they have refused to natural right. Many of our noble deputies owe to ladies the honour of sitting among the representatives of the nation. Why, instead of depriving of this right women who were owners of landed estates, was it not extended to all those who possessed property or were heads of households? Why, if it be found absurd to exercise the right of citizenship by proxy, deprive women of this right, rather than leave them the liberty of exercising it in person?

Chapter 5

MALTHUS

5.1 The education of Malthus

T.R. Malthus' *Essay on The Principle of Population*, the first edition of which was published in 1798, was one of the the first systematic studies of the problem of population in relation to resources. Earlier discussions of the problem had been published by Boterro in Italy, Robert Wallace in England, and Benjamin Franklin in America. However Malthus' *Essay* was the first to stress the fact that, in general, powerful checks operate continuously to keep human populations from increasing beyond their available food supply. In a later edition, published in 1803, he buttressed this assertion with carefully collected demographic and sociological data from many societies at various periods of their histories.

The publication of Malthus' *Essay* coincided with a wave of disillusionment which followed the optimism of the Enlightenment. The utopian societies predicted by the philosophers of the Enlightenment were compared with reign of terror in Robespierre's France and with the miseries of industrial workers in England; and the discrepancy required an explanation. The optimism which preceded the French Revolution, and the disappointment which followed a few years later, closely paralleled the optimistic expectations of our own century, in the period after the Second World War, when it was thought that the transfer of technology to the less developed parts of the world would eliminate poverty, and the subsequent disappointment when poverty persisted. Science and technology developed rapidly in the second half of the twentieth century, but the benefits which they conferred were just as rapidly consumed by a global population which today is increasing at the rate of one billion people every decade. Because of the close parallel between the optimism and disappointments of Malthus' time and those of our own, much light can be thrown on our present situation by rereading the debate between Malthus and his contemporaries.

Thomas Robert Malthus (1766-1834) came from an intellectual family: His father, Daniel Malthus, was a moderately well-to-do English country gentleman, an enthusiastic believer in the optimistic ideas of the Enlightenment, and a friend of the philosophers Jean-Jaques Rousseau, David Hume and William Godwin. The famous book on population by the younger Malthus grew out of conversations with his father.

Figure 5.1: **The Rookery near Dorking in Surrey**

Daniel Malthus attended Oxford, but left without obtaining a degree. He later built a country home near Dorking, which he called "The Rookery". The house had Gothic battlements, and the land belonging to it contained a beech forest, an ice house, a corn mill, a large lake, and serpentine walks leading to "several romantic buildings with appropriate dedications". Daniel Malthus was an ardent admirer of Rousseau; and when the French philosopher visited England with his mistress, Thérése le Vasseur, Danial Malthus entertained him at the Rookery. Rousseau and Thérése undoubtedly saw Daniel's baby son (who was always called Robert or Bob) and they must have noticed with pity that he had been born with a hare lip. This was later sutured, and apart from a slight scar which marked the operation, he became very handsome.

Robert Malthus was at first tutored at home; but in 1782, when he was 16 years old, he was sent to study at the famous Dissenting Academy at Warrington in Lancashire. Joseph Priestley had taught at Warrington, and he had completed his famous *History of Electricity* there, as well as his *Essay on Government*, which contains the phrase "the greatest good for the greatest number".

Robert's tutor at Warrington Academy was Gilbert Wakefield (who was later imprisoned for his radical ideas). When Robert was 18, Wakefield arranged for him to be admitted to Jesus College, Cambridge University, as a student of mathematics. Robert Malthus graduated from Cambridge in 1788 with a first-class degree in mathematics. He was Ninth Wrangler, which meant that he was the ninth-best mathematician in his graduating class. He also won prizes in declamation, both in English and in Latin, which is surprising in view of the speech defect from which he suffered all his life.

5.2 Debate on the views of Godwin and Condorcet

In 1793, Robert Malthus was elected a fellow of Jesus College, and he also took orders in the Anglican Church. He was assigned as Curate to Okewood Chapel in Surrey. This small chapel stood in a woodland region, and Malthus' illiterate parishioners were so poor

that the women and children went without shoes. They lived in low thatched huts made of woven branches plastered with mud. The floors of these huts were of dirt, and the only light came from tiny window openings. Malthus' parishioners diet consisted almost entirely of bread. The children of these cottagers developed late, and were stunted in growth. Nevertheless, in spite of the harsh conditions of his parishioners' lives, Malthus noticed that the number of births which he recorded in the parish register greatly exceeded the number of deaths. It was probably this fact which first turned his attention to the problem of population.

By this time, Daniel Malthus had sold the Rookery; and after a period of travel, he had settled with his family at Albury, about nine miles from Okewood Chapel. Robert Malthus lived with his parents at Albury, and it was here that the famous debates between father and son took place. 1793, the year when Robert Malthus took up his position at Okewood, was also the year in which Danial Malthus friend, William Godwin, published his enormously optimistic book, *Political Justice*. In this book, Godwin predicted a future society where scientific progress would liberate humans from material want. Godwin predicted that in the future, with the institution of war abolished, with a more equal distribution of property, and with the help of scientific improvements in agriculture and industry, much less labour would be needed to support life. Luxuries are at present used to maintain artificial distinctions between the classes of society, Godwin wrote, but in the future values will change; humans will live more simply, and their efforts will be devoted to self-fulfillment and to intellectual and moral improvement, rather than to material possessions. With the help of automated agriculture, the citizens of a future society will need only a few hours a day to earn their bread.

Godwin went on to say, "The spirit of oppression, the spirit of servility and the spirit of fraud - these are the immediate growth of the established administration of property. They are alike hostile to intellectual improvement. The other vices of envy , malice, and revenge are their inseparable companions. In a state of society where men lived in the midst of plenty, and where all shared alike the bounties of nature, these sentiments would inevitably expire. The narrow principle of selfishness would vanish. No man being obliged to guard his little store, or provide with anxiety and pain for his restless wants, each would lose his own individual existence in the thought of the general good. No man would be the enemy of his neighbor, for they would have nothing to contend; and of consequence philanthropy would resume the empire which reason assigns her. Mind would be delivered from her perpetual anxiety about corporal support, and free to expatiate in the field of thought which is congenial to her. Each man would assist the inquiries of all."

Godwin insisted that there is an indissoluble link between politics, ethics and knowledge. *Political Justice* is an enthusiastic vision of what humans could be like at some future period when the trend towards moral and intellectual improvement has lifted men and women above their their present state of ignorance and vice. Much of the savage structure of the penal system would then be unnecessary, Godwin believed. (At the time when he was writing, there were more than a hundred capital offenses in England, and this number had soon increased to almost two hundred. The theft of any object of greater value than ten shillings was punishable by hanging.) In its present state, Godwin wrote, society

Figure 5.2: **William Godwin (1756-1836).**

Figure 5.3: **Thomas Robert Malthus (1766-1834).**

decrees that the majority of its citizens "should be kept in abject penury, rendered stupid with ignorance and disgustful with vice, perpetuated in nakedness and hunger, goaded to the commission of crimes, and made victims to the merciless laws which the rich have instituted to oppress them". But human behavior is produced by environment and education, Godwin pointed out. If the conditions of upbringing were improved, behavior would also improve. In fact, Godwin believed that men and women are subject to natural laws no less than the planets of Newton's solar system. "In the life of every human", Godwin wrote, "there is a chain of causes, generated in that eternity which preceded his birth, and going on in regular procession through the whole period of his existence, in consequence of which it was impossible for him to act in any instance otherwise than he has acted."

The chain of causality in human affairs implies that vice and crime should be regarded with the same attitude with which we regard disease. The causes of poverty, ignorance, vice and crime should be removed. Human failings should be cured rather than punished. With this in mind, Godwin wrote, "our disapprobation of vice will be of the same nature as our disapprobation of an infectious distemper."

In France the Marquis de Condorcet had written an equally optimistic book, *Esquisse d'un Tableau Historique des Progrès de l'Esprit Humain*. Condorcet's optimism was unaffected even by the fact that at the time when he was writing he was in hiding, under sentence of death by Robespierre's government. Besides enthusiastically extolling Godwin's

ideas to his son, Daniel Malthus also told him of the views of Condorcet.

Condorcet's *Esquisse*, is an enthusiastic endorsement of the idea of infinite human perfectibility which was current among the philosophers of the 18th century, and in this book, Condorcet anticipated many of the evolutionary ideas of Charles Darwin. He compared humans with animals, and found many common traits. Condorcet believed that animals are able to think, and even to think rationally, although their thoughts are extremely simple compared with those of humans. He also asserted that humans historically began their existence on the same level as animals and gradually developed to their present state. Since this evolution took place historically, he reasoned, it is probable, or even inevitable, that a similar evolution in the future will bring mankind to a level of physical, mental and moral development which will be as superior to our own present state as we are now superior to animals. In his *Esquisse*, Condorcet called attention to the unusually long period of dependency which characterizes the growth and education of human offspring. This prolonged childhood is unique among living beings. It is needed for the high level of mental development of the human species; but it requires a stable family structure to protect the young during their long upbringing.

Thus, according to Condorcet, biological evolution brought into existence a moral precept, the sanctity of the family.

Similarly, Condorcet maintained, larger associations of humans would have been impossible without some degree of altruism and sensitivity to the suffering of others incorporated into human behavior, either as instincts or as moral precepts or both; and thus the evolution of organized society entailed the development of sensibility and morality.

Condorcet believed that ignorance and error are responsible for vice; and he listened what he regarded as the main mistakes of civilization: hereditary transmission of power, inequality between men and women, religious bigotry, disease, war, slavery, economic inequality, and the division of humanity into mutually exclusive linguistic groups.

Condorcet believed the hereditary transmission of power to be the source of much of the tyranny under which humans suffer; and he looked forward to an era when republican governments would be established throughout the world. Turning to the inequality between men and women, Condorcet wrote that he could see no moral, physical or intellectual basis for it. He called for complete social, legal, and educational equality between the sexes.

Condorcet predicted that the progress of medical science would free humans from the worst ravages of disease. Furthermore, he maintained that since perfectibility (i.e. evolution) operates throughout the biological world, there is no reason why mankind's physical structure might not gradually improve, with the result that human life in the remote future could be greatly prolonged. Condorcet believed that the intellectual and moral facilities of man are capable of continuous and steady improvement; and he thought that one of the most important results of this improvement will be the abolition of war.

As Daniel Malthus talked warmly about Godwin, Condorcet, and the idea of human progress, the mind of his son, Robert, turned to the unbalance between births and deaths which he had noticed among his parishioners at Okewood Chapel. He pointed out to his father that no matter what benefits science might be able to confer, they would soon be eaten up by population growth. Regardless of technical progress, the condition of the

Figure 5.4: **The Marquis de Condorcet (1743-1794).**

lowest social class would remain exactly the same: The poor would continue to live, as they always had, on the exact borderline between survival and famine, clinging desperately to the lower edge of existence. For them, change for the worse was impossible since it would loosen their precarious hold on life; their children would die and their numbers would diminish until they balanced the supply of food. But any change for the better was equally impossible, because if more nourishment should become available, more of the children of the poor would survive, and the share of food for each of them would again be reduced to the precise minimum required for life.

Observation of his parishioners at Okewood had convinced Robert Malthus that this sombre picture was a realistic description of the condition of the poor in England at the end of the 18th century. Techniques of agriculture and industry were indeed improving rapidly; but among the very poor, population was increasing equally fast, and the misery of society's lowest class remained unaltered.

Daniel Malthus was so impressed with his son's arguments that he urged him to develop them into a small book. Robert Malthus' first essay on population, written in response to his father's urging, was only 50,000 words in length. It was was published anonymously in 1798, and its full title was *An Essay on the Principle of Population, as it affects the future improvement of society, with remarks on the speculations of Mr. Godwin, M. Condorcet, and other writers.* Robert Malthus' Essay explored the consequences of his basic thesis: that "the power of population is indefinitely greater than the power in the earth to produce subsistence for man".

5.3 Publication of the first essay in 1798

"That population cannot increase without the means of subsistence", Robert Malthus wrote, "is a proposition so evident that it needs no illustration. That population does invariably increase, where there are means of subsistence, the history of every people who have ever existed will abundantly prove. And that the superior power cannot be checked without producing misery and vice, the ample portion of these two bitter ingredients in the cup of human life, and the continuance of the physical causes that seem to have produced them, bear too convincing a testimony."

In order to illustrate the power of human populations to grow quickly to enormous numbers if left completely unchecked, Malthus turned to statistics from the United States, where the population had doubled every 25 years for a century and a half. Malthus called this type of growth "geometrical" (today we would call it "exponential"); and, drawing on his mathematical education, he illustrated it by the progression 1,2,4,8,16,32,64,128,256,..etc. In order to show that, in the long run, no improvement in agriculture could possibly keep pace with unchecked population growth, Malthus allowed that, in England, agricultural output might with great effort be doubled during the next quarter century; but during a subsequent 25-year period it could not again be doubled. The growth of agricultural output could at the very most follow an arithmetic (linear) progression, 1,2,3,4,5,6,...etc.

Because of the overpoweringly greater numbers which can potentially be generated by

exponential population growth, as contrasted to the slow linear progression of sustenance, Malthus was convinced that at almost all stages of human history, population has not expanded freely, but has instead pressed painfully against the limits of its food supply. He maintained that human numbers are normally held in check either by "vice or misery". (Malthus classified both war and birth control as a forms of vice.) Occasionally the food supply increases through some improvement in agriculture, or through the opening of new lands; but population then grows very rapidly, and soon a new equilibrium is established, with misery and vice once more holding the population in check.

Like Godwin's *Political Justice*, Malthus' *Essay on the Principle of Population* was published at exactly the right moment to capture the prevailing mood of England. In 1793, the mood had been optimistic; but by 1798, hopes for reform had been replaced by reaction and pessimism. Public opinion had been changed by Robespierre's Reign of Terror and by the threat of a French invasion. Malthus' clear and powerfully written essay caught the attention of readers not only because it appeared at the right moment, but also because his two contrasting mathematical laws of growth were so striking.

One of Malthus' readers was William Godwin, who recognized the essay as the strongest challenge to his utopian ideas that had yet been published. Godwin several times invited Malthus to breakfast at his home to discuss social and economic problems. (After some years, however, the friendship between Godwin and Malthus cooled, the debate between them having become more acrimonious.)

In 1801, Godwin published a reply to his critics, among them his former friends James Mackintosh and Samuel Parr, by whom he recently had been attacked. His *Reply to Parr* also contained a reply to Malthus: Godwin granted that the problem of overpopulation raised by Malthus was an extremely serious one. However, Godwin wrote, all that is needed to solve the problem is a change of the attitudes of society. For example we need to abandon the belief "that it is the first duty of princes to watch for (i.e. encourage) the multiplication of their subjects, and that a man or woman who passes the term of life in a condition of celibacy is to be considered as having failed to discharge the principal obligations owed to the community". "On the contrary", Godwin continued, "it now appears to be rather the man who rears a numerous family that has to some degree transgressed the consideration he owes to the public welfare". Godwin suggested that each marriage should be allowed only two or three children or whatever number might be needed to balance the current rates of mortality and celibacy. This duty to society, Godwin wrote, would surely not be too great a hardship to be endured, once the reasons for it were thoroughly understood.

5.4 The second essay published in 1803

Malthus' small essay had captured public attention in England, and he was anxious to expand it with empirical data which would show his principle of population to be valid not only in England in his own day, but in all societies and all periods. He therefore traveled widely, collecting data. He also made use of the books of explorers, such as Cook and Vancouver.

Malthus second edition - more than three times the length of his original essay on population - was ready in 1803. Book I and Book II of the 1803 edition of Malthus' *Essay* are devoted to a study of the checks to population growth which have operated throughout history in all the countries of the world for which he possessed facts.

In his first chapter, Malthus stressed the potentially enormous power of population growth contrasted the slow growth of the food supply. He concluded that strong checks to the increase of population must almost always be operating to keep human numbers within the bounds of sustenance. He classified the checks as either preventive or positive, the preventive checks being those which reduce fertility, while the positive checks are those which increase mortality. Among the positive checks, Malthus listed "unwholesome occupations, severe labour and exposure to the seasons, extreme poverty, bad nursing of children, great towns, excesses of all kinds, the whole train of common diseases and epidemics, wars, plague, and famine".

In the following chapters of Books I, Malthus showed in detail the mechanisms by which population is held at the level of sustenance in various cultures. He first discussed primitive hunter-gatherer societies, such as the inhabitants of Tierra del Fuego, Van Diemens Land and New Holland, and those tribes of North American Indians living predominantly by hunting. In hunting societies, he pointed out, the population is inevitably very sparse: "The great extent of territory required for the support of the hunter has been repeatedly stated and acknowledged", Malthus wrote, "...The tribes of hunters, like beasts of prey, whom they resemble in their mode of subsistence, will consequently be thinly scattered over the surface of the earth."

"Like beasts of prey, they must either drive away or fly from every rival, and be engaged in perpetual contests with each other...The neighboring nations live in a perpetual state of hostility with each other. The very act of increasing in one tribe must be an act of aggression against its neighbors, as a larger range of territory will be necessary to support its increased numbers.

'The contest will in this case continue, either till the equilibrium is restored by mutual losses, or till the weaker party is exterminated or driven from its country... Their object in battle is not conquest but destruction. The life of the victor depends on the death of the enemy". Malthus concluded that among the American Indians of his time, war was the predominant check to population growth, although famine, disease and infanticide each played a part.

In the next chapter, Malthus quoted Captain Cook's description of the natives of the region near Queen Charlotte's Sound in New Zealand, whose way of life involved perpetual war. "If I had followed the advice of all our pretended friends", Cook wrote, "I might have extirpated the whole race; for the people of each hamlet or village, by turns, applied to me to destroy the other". According to Cook, the New Zealanders practiced both ceaseless war and cannibalism; and population pressure provided a motive for both practices.

In later chapters on nomadic societies of the Near East and Asia, war again appears, not only as a consequence of the growth of human numbers, but also as one of the major mechanisms by which these numbers are reduced to the level of their food supply. The studies quoted by Malthus make it seem likely that the nomadic Tartar tribes of central

Figure 5.5: **Captain James Cook, FRS (1728-1779). According to Cook, the native New Zealanders practiced both ceaseless war and cannibalism; and population pressure provided a motive for both practices. Malthus based his description of hunter-gatherer societies on the writings of explorers such as Cook and Vancouver.**

Asia made no use of the preventive checks to population growth. In fact the Tartar tribes may have regarded growth of their own populations as useful in their wars with neighboring tribes.

Malthus also described the Germanic tribes of Northern Europe, whose population growth led them to the attacks which destroyed the Roman Empire.

He quoted the following passage from Machiavelli's History of Florence: "The people who inhabit the northern parts that lie between the Rhine and the Danube, living in a healthful and prolific climate, often increase to such a degree that vast numbers of them are forced to leave their native country and go in search of new habitations. When any of those provinces begins to grow too populous and wants to disburden itself, the following method is observed. In the first place, it is divided into three parts, in each of which there is an equal portion of the nobility and commonality, the rich and the poor. After this they cast lots; and that division on which the lot falls quits the country and goes to seek its fortune, leaving the other two more room and liberty to enjoy their possessions at home. These emigrations proved the destruction of the Roman Empire". Regarding the Scandinavians in the early middle ages, Malthus wrote: "Mallet relates, what is probably true, that it was their common custom to hold an assembly every spring for the purpose of considering in what quarter they should make war".

In many of the societies which Malthus described, a causal link can be seen, not only between population pressure and poverty, but also between population pressure and war. As one reads his *Essay*, it becomes clear why both these terrible sources of human anguish saturate so much of history, and why efforts to eradicate them have so often met with failure: The only possible way to eliminate poverty and war is to reduce the pressure of population by preventive checks, since the increased food supply produced by occasional cultural advances can give only very temporary relief.

In Book II, Malthus turned to the nations of Europe, as they appeared at the end of the 18th century, and here he presents us with a different picture. Although in these societies poverty, unsanitary housing, child labour, malnutrition and disease all took a heavy toll, war produced far less mortality than in hunting and pastoral societies, and the preventive checks, which lower fertility, played a much larger roll.

Malthus had visited Scandinavia during the summer of 1799, and he had made particularly detailed notes on Norway. He was thus able to present a description of Norwegian economics and demography based on his own studies. Norway was remarkable for having the lowest reliably-recorded death rate of any nation at that time: Only 1 person in 48 died each year in Norway. (By comparison, 1 person in 20 died each year in London.) The rate of marriage was also remarkably low, with only 1 marriage each year for every 130 inhabitants; and thus in spite of the low death rate, Norway's population had increased only slightly from the 723,141 inhabitants recorded in 1769.

There were two reasons for late marriage in Norway: Firstly, every man born of a farmer or a labourer was compelled by law to be a soldier in the reserve army for a period of ten years; and during his military service, he could not marry without the permission of both his commanding officer and the parish priest. These permissions were granted only to those who were clearly in an economic position to support a family. Men could be inducted

into the army at any age between 20 and 30, and since commanding officers preferred older recruits, Norwegian men were often in their 40's before they were free to marry. At the time when Malthus was writing, these rules had just been made less restrictive; but priests still refused to unite couples whose economic foundations they judged to be insufficient.

The second reason for late marriages was the structure of the farming community. In general, Norwegian farms were large; and the owner's household employed many young unmarried men and women as servants. These young people had no chance to marry unless a smaller house on the property became vacant, with its attached small parcel of land for the use of the "houseman"; but because of the low death rate, such vacancies were infrequent.

Thus Norway's remarkably low death rate was balanced by a low birth rate. Other chapters in Book II are devoted to the checks to population growth in Sweden, Russia, Central Europe, Switzerland, France, England, Scotland and Ireland.

Malthus painted a very dark panorama of population pressure and its consequences in human societies throughout the world and throughout history: At the lowest stage of cultural development are the hunter-gatherer societies, where the density of population is extremely low. Nevertheless, the area required to support the hunters is so enormous that even their sparse and thinly scattered numbers press hard against the limits of sustenance. The resulting competition for territory produces merciless intertribal wars.

The domestication of animals makes higher population densities possible; and wherever this new mode of food production is adopted, human numbers rapidly increase; but very soon a new equilibrium is established, with the population of pastoral societies once more pressing painfully against the limits of the food supply, growing a little in good years, and being cut back in bad years by famine, disease and war.

Finally, agricultural societies can maintain extremely high densities of population; but the time required to achieve a new equilibrium is very short. After a brief period of unrestricted growth, human numbers are once more crushed against the barrier of limited resources; and if excess lives are produced by overbreeding, they are soon extinguished by deaths among the children of the poor.

Malthus was conscious that he had drawn an extremely dark picture of the human condition. He excused himself by saying that he has not done it gratuitously, but because he was convinced that the dark shades really are there, and that they form an important part of the picture. He did allow one ray of light, however: By 1803, his own studies of Norway, together with personal conversations with Godwin and the arguments in Godwin's *Reply to Parr*, had convinced Malthus that "moral restraint" should be included among the possible checks to population growth. Thus he concluded Book II of his 1803 edition by saying that the checks which keep population down to the level of the means of subsistence can all be classified under the headings of "moral restraint, vice and misery". (In his first edition he had maintained that vice and misery are the only possibilities).

5.5 Systems of equality

In the 1803 edition of Malthus' *Essay*, Books III and IV form a second volume.

The ideas which he put forward in this second volume are much more open to dispute than are the solidly empirical demographic studies of Books I and II. Malthus excused himself at the beginning of the second volume, saying that he realized that the ideas which he was about to put forward were less solidly based than those in his first volume. However, he said that he wished to explore all the consequences of his principle of population: "..Even the errors into which I may have fallen", he wrote, "by according a handle to argument, and an additional excitement to examination, may be subservient to the important end of bringing a subject so nearly connected with the happiness of society into more general notice".

Malthus began Book III by discussing the systems of equality proposed by Condorcet and Godwin; and he tried to show that such utopian societies would prove impossible in practice, because they would rapidly drown in a flood of excess population. Condorcet himself had recognized this difficulty. He realized that improved living conditions for the poor would lead to a rapid growth of population. "Must not a period then arrive", Condorcet had written, "... when the increase of the number of men surpassing their means of subsistence, the necessary result must be either a continual diminution of happiness and population... or at least a kind of oscillation between good and evil?"

Condorcet believed the serious consequences of population pressure to be far in the future, but Malthus disagreed with him on exactly that point: "M. Condorcet's picture of what may be expected to happen when the number of men shall surpass subsistence is justly drawn... The only point in which I differ from M. Condorcet in this description is with regard to the period when it may be applied to the human race... This constantly subsisting cause of periodical misery has existed in most countries ever since we have had any histories of mankind, and continues to exist at the present moment."

"M. Condorcet, however, goes on to say", Malthus continued, "that should the period, which he conceives to be so distant, ever arrive, the human race, and the advocates of the perfectibility of man, need not be alarmed at it. He then proceeds to remove the difficulty in a manner which I profess not to understand. Having observed that the ridiculous prejudices of superstition would by that time have ceased to throw over morals a corrupt and degrading austerity, he alludes either to a promiscuous concubinage, which would prevent breeding, or to something else as unnatural. To remove the difficulty in this way will surely, in the opinion of most men, be to destroy that virtue and purity of manners which the advocates of equality and of the perfectibility of man profess to be the end and object of their views."

When Malthus referred to "something else as unnatural", he of course meant birth control, some forms of which existed at the time when he was writing; and in this passage we see that he was opposed to the practice. He preferred late marriage or "moral restraint" as a means of limiting excessive population growth.

After his arguments against Condorcet, Malthus discussed William Godwin's egalitarian utopia, which, he said, would be extremely attractive if only it could be achieved: "The

system of equality which Mr. Godwin proposes", Malthus wrote, "is, on the first view of it, the most beautiful and engaging which has yet appeared. A melioration of society to be produced merely by reason and conviction gives more promise of permanence than than any change effected and maintained by force. The unlimited exercise of private judgement is a doctrine grand and captivating, and has a vast superiority over those systems where every individual is in a manner the slave of the public."

"The substitution of benevolence, as a master-spring and moving principle of society, instead of self-love, appears at first sight to be a consummation devoutly to be wished. In short, it is impossible to contemplate the whole of this fair picture without emotions of delight and admiration, accompanied with an ardent longing for the period of its accomplishment."

"But alas!" Malthus continued, "That moment can never arrive.... The great error under which Mr. Godwin labours throughout his whole work is the attributing of almost all the vices and misery that prevail in civil society to human institutions. Political regulations and the established administration of property are, with him, the fruitful sources of all evil, the hotbeds of all the crimes that degrade mankind. Were this really a true state of the case, it would not seem a completely hopeless task to remove evil completely from the world; and reason seems to be the proper and adequate instrument for effecting so great a purpose. But the truth is, that though human institutions appear to be, and indeed often are, the obvious and obtrusive causes of much misery in society, they are, in reality, light and superficial in comparison with those deeper-seated causes of evil which result from the laws of nature and the passions of mankind."

The passions of mankind drive humans to reproduce, while the laws of nature set limits to the carrying capacity of the environment. Godwin's utopia, if established, would be very favorable to the growth of population; and very soon the shortage of food would lead to its downfall: Because of the overpowering force of population growth, "Man cannot live in the midst of plenty. All cannot share alike the bounties of nature. Were there no established administration of property, every man would be obliged to guard with his force his little store. Selfishness would be triumphant. The subjects of contention would be perpetual. Every individual would be under constant anxiety about corporal support, and not a single intellect would be left free to expatiate in the field of thought."

Malthus believed that all systems of equality are doomed to failure, not only because of the powerful pressure of population growth, but also because differences between the upper, middle, and lower classes serve the useful purpose of providing humans with an incentive for hard work. He thought that fear of falling to a lower social status, and hope of rising to a higher one, provide a strong incentive for constructive activity. However, he believed that happiness is most often found in the middle ranks of society, and that therefore the highest and lowest classes ought not to be large. Malthus advocated universal education and security of property as means by which the lowest classes of society could be induced to adopt more virtuous and prudent patterns of behavior.

5.6 The Poor Laws

Among the most controversial chapters of Malthus' second volume are those dealing with the Poor Laws. During the reign of Queen Elisabeth I, a law had been enacted according to which justices were authorized to collect taxes in order to set to work "...the children of all such, whose parents shall not by the said persons be thought able to keep and maintain their children; and also such persons, married or unmarried, as, having no means to maintain them, use no ordinary or daily trade to get their living by..". Malthus commented:

"What is this but saying that the funds for the maintenance of labour in this country may be increased without limit by a fiat of government...? Strictly speaking, this clause is as arrogant and absurd as if it had enacted that two ears of wheat should in the future grow where one had grown before. Canute, when he commanded the waves not to wet his princely foot, did not assume a greater power over the laws of nature." Malthus pointed out that if we believe that every person has a right to have as many children as he or she wishes, and if we enact a law, according to which every person born has a right to sustenance, then we implicitly assume that the supply of food can be increased without limit, which of course is impossible.

During the first few years of the nineteenth century there was a severe shortage of food in England, partly because of war with France, and partly because of harvest failures. As a result, the price of wheat tripled, causing great distress among the poor. By 1803, 3,000,000 pounds sterling were being distributed to make up the difference between the wages of poor workers and the amount which they needed to pay for food. Malthus regarded the supply of grain as constant, i.e. independent of the price; and he therefore believed that distribution of money under the Poor Laws merely raised the price of grain still further in relation to wages, forcing a larger number of independent workers to seek help. He thought that the distributed money helped to relieve suffering in some cases, but that it spread the suffering over a wider area.

In some parishes, the amount of money distributed under the Poor Laws was proportional to the number of children in a family, and Malthus believed that this encouraged the growth of population, further aggravating the shortage of food. "A poor man may marry with little or no prospect of being able to support a family in independence", he wrote, "...and the Poor Laws may be said therefore in some measure to create the poor which they maintain; and as the provisions of the country must, in consequence of the increased population, be distributed to every man in smaller proportions, it is evident that the labour of those who are not supported by parish assistance, will purchase a smaller quantity of provisions than before, and consequently more of them must be driven to ask for support." Malthus advocated a very gradual abolition of the Poor Laws, and he believed that while this change was being brought about, the laws ought to be administered in such a way that the position of least well-off independent workers should not be worse than the position of those supported by parish assistance.

5.7 Replies to Malthus

The second edition of Malthus' *Essay* was published in 1803. It provoked a storm of controversy, and a flood of rebuttals. In 1803 England's political situation was sensitive. Revolutions had recently occurred both in America and in France; and in England there was much agitation for radical change, against which Malthus provided counter-arguments. Pitt and his government had taken Malthus' first edition seriously, and had abandoned their plans for extending the Poor Laws. Also, as a consequence of Malthus' ideas, England's first census was taken in 1801. This census, and subsequent ones, taken in 1811, 1821 and 1831, showed that England's population was indeed increasing rapidly, just as Malthus had feared. (The population of England and Wales more than doubled in 80 years, from an estimated 6.6 million in 1750 to almost 14 million in 1831.) In 1803, the issues of poverty and population were at the center of the political arena, and articles refuting Malthus began to stream from the pens of England's authors.

William Coleridge planned to write an article against Malthus, and he made extensive notes in the margins of his copy of the *Essay*. In one place he wrote: "Are Lust and Hunger both alike Passions of physical Necessity, and the one equally with the other independent of the Reason and the Will? Shame upon our race that there lives an individual who dares to ask the Question." In another place Coleridge wrote: "Vice and Virtue subsist in the agreement of the habits of a man with his Reason and Conscience, and these can have but one moral guide, Utility, or the virtue and Happiness of Rational Beings". Although Coleridge never wrote his planned article, his close friend Robert Southey did so, using Coleridge's notes almost verbatim. Some years later Coleridge remarked: "Is it not lamentable - is it not even marvelous - that the monstrous practical sophism of Malthus should now have gained complete possession of the leading men of the kingdom! Such an essential lie in morals - such a practical lie in fact it is too! I solemnly declare that I do not believe that all the heresies and sects and factions which ignorance and the weakness and wickedness of man have ever given birth to, were altogether so disgraceful to man as a Christian, a philosopher, a statesman or citizen, as this abominable tenet."

In 1812, Percy Bysshe Shelley, who was later to become William Godwin's son-in-law, wrote: "Many well-meaning persons... would tell me not to make people happy for fear of over-stocking the world... War, vice and misery are undoubtedly bad; they embrace all that we can conceive of temporal and eternal evil. Are we to be told that these are remedyless, because the earth would in case of their remedy, be overstocked?" A year later, Shelley called Malthus a "priest, eunuch, and tyrant", and accused him, in a pamphlet, of proposing that ".. after the poor have been stript naked by the taxgatherer and reduced to bread and tea and fourteen hours of hard labour by their masters.. the last tie by which Nature holds them to benignant earth (whose plenty is garnered up in the strongholds of their tyrants) is to be divided... They are required to abstain from marrying under penalty of starvation... whilst the rich are permitted to add as many mouths to consume the products of the poor as they please".

Godwin himself wrote a long book (which was published in 1820) entitled Of *Population, An Enquiry Concerning the Power and Increase in the Number of Mankind, being an*

Figure 5.6: **Coleridge's notes on Malthus: "I do not believe that all the heresies and sects and factions which ignorance and the weakness and wickedness of man have ever given birth to, were altogether so disgraceful to man as a Christian, a philosopher, a statesman or citizen, as this abominable tenet."**

Figure 5.7: **Shelley: "'.. after the poor have been stript naked by the taxgatherer and reduced to bread and tea and fourteen hours of hard labour by their masters.. the last tie by which Nature holds them to benignant earth (whose plenty is garnered up in the strongholds of their tyrants) is to be divided...They are required to abstain from marrying under penalty of starvation..."**

Figure 5.8: **Tiny Tim, from Charles Dickens' *A Christmas Carol*. When he is informed that Tiny Tim will die unless he receives medical treatment, Scrooge remarks, "Then he had better die and reduce the surplus population!". Many of the events in Dickens' books can be viewed as protests against the ideas of Malthus.**

Figure 5.9: **Charles Dickens' Oliver Twist asks for a second portion of gruel, provoking a storm of outrage. As a boy, Dickens himself spent some time in a workhouse.**

Figure 5.10: **A portrait of the British political economist, author and social theorist Harriet Martineau (1802-1876). She was a very close friend of Charles Darwin's older brother, Erasmus. Commenting on the ideas of Malthus, she wrote: "Prudence as to time of marriage and making due provision for it was, one would think, a harmless recommendation enough, under the circumstances." Martineau's books were highly successful, sometimes outselling those of Charles Dickens.**

answer to Mr. Malthus. One can also view many of the books of Charles Dickens as protests against Malthus' point of view. For example, Oliver Twist gives us a picture of a workhouse "administered in such a way that the position of least well-off independent workers should not be worse than the position of those supported by parish assistance."

Among the authors defending Malthus was Harriet Martineau, who wrote: "The desire of his heart and the aim of his work were that domestic virtue and happiness should be placed within the reach of all... He found that a portion of the people were underfed, and that one consequence of this was a fearful mortality among infants; and another consequence the growth of a recklessness among the destitute which caused infanticide, corruption of morals, and at best, marriage between pauper boys and girls; while multitudes of respectable men and women, who paid rates instead of consuming them, were unmarried at forty or never married at all. Prudence as to time of marriage and for making due provision for it was, one would think, a harmless recommendation enough, under the circumstances."

5.8 Ricardo's Iron Law of Wages; the Corn Laws

Malthus continued a life of quiet scholarship, unperturbed by the heated public debate which he had caused. At the age of 38, he married a second cousin. The marriage produced only three children, which at that time was considered to be a very small number. Thus he practiced the pattern of late marriage which he advocated. Although he was appointed rector of a church in Lincolnshire, he never preached there, hiring a curate to do this in his place. Instead of preaching, Malthus accepted an appointment as Professor of History and Political Economy at the East India Company's College at Haileybury. This appointment made him the first professor of economics in England, and probably also the first in the world. Among the important books which he wrote while he held this post was *Principles of Political Economy, Considered with a View to their Practical Application*. Malthus also published numerous revised and expanded editions of his *Essay on the Principle of Population*. The third edition was published in 1806, the fourth in 1807, the fifth in 1817, and the sixth in 1826.

Malthus became a close friend of the wealthy financier and economic theorist, David Ricardo (1772-1823). He and Ricardo met frequently to discuss economic problems, and when circumstances prevented them from meeting, they exchanged endless letters. Ricardo and Malthus differed on the subject of the Corn Laws, but they never allowed this difference of opinion to affect their friendship.

Although shortages of food had produced drastic increases in the price of grain, the import of cheap foreign grain was effectively prevented by the Corn Laws. These laws had been introduced by the large landowners, who controlled Parliament, but they were opposed by the manufacturers, who wished to make less expensive food available to their workers. On this issue, Malthus sided with the landowners, arguing that if England became dependent on imports of foreign grain, the country would be insecure: What if England's ability to export manufactured goods in exchange for the grain should later be undermined

Figure 5.11: **The economist David Ricardo (1772-1823), a close friend of Malthus. The joint pessimism of Ricardo and Malthus caused Carlyle to call economics "the dismal science".**

by foreign competition? Malthus pointed out that the country would then face starvation. Ricardo, on the other hand, sided with the rising class of manufacturers. In 1832 the Reform Bill gave the manufacturers control of Parliament, the Corn Laws were repealed, and England's rapidly-growing population became dependent on imports of foreign grain.

Ricardo accepted Malthus' principle of population, and from it he deduced what came to be called his "Iron Law of Wages". According to Ricardo, labor is a commodity, and wages are determined by the law of supply and demand: When wages fall below the starvation level, the workers' children die. Labor then becomes a scarce commodity, and wages rise. On the other hand, when wages rise above the starvation level, the working population multiplies rapidly, labor becomes a plentiful commodity, and wages fall again.

Thus, according to Ricardo, there is an Iron Law which holds wages at the minimum level at which life can be supported. The combined pessimism of Malthus and Ricardo caused Carlyle to call economics "the dismal science".

Chapter 6

AMERICA

6.1 The United States Constitution and Bill of Rights

The history of the Federal Constitution of the United States is an interesting one. It was preceded by the Articles of Confederation, which were written by the Second Continental Congress between 1776 and 1777, but it soon became clear that Confederation was too weak a form of union for a collection of states.

George Mason, one of the drafters of the Federal Constitution, believed that "such a government was necessary as could directly operate on individuals, and would punish those only whose guilt required it", while another drafter, James Madison, wrote that the more he reflected on the use of force, the more he doubted "the practicality, the justice and the efficacy of it when applied to people collectively, and not individually."

Finally, Alexander Hamilton, in his Federalist Papers, discussed the Articles of Confederation with the following words: "To coerce the states is one of the maddest projects that was ever devised... Can any reasonable man be well disposed towards a government which makes war and carnage the only means of supporting itself, a government that can exist only by the sword? Every such war must involve the innocent with the guilty. The single consideration should be enough to dispose every peaceable citizen against such government... What is the cure for this great evil? Nothing, but to enable the... laws to operate on individuals, in the same manner as those of states do."

In other words, the essential difference between a confederation and a federation, both of them unions of states, is that a federation has the power to make and to enforce laws that act on individuals, rather than attempting to coerce states (in Hamilton's words, "one of the maddest projects that was ever devised.") The fact that a confederation of states was found to be far too weak a form of union is especially interesting because our present United Nations is a confederation. We are at present attempting to coerce states with sanctions that are "applied to people collectively and not individually."The International Criminal Court, which we will discuss below, is a development of enormous importance, because it acts on individuals, rather than attempting to coerce states.

There are many historical examples of successful federations; but in general, unions of

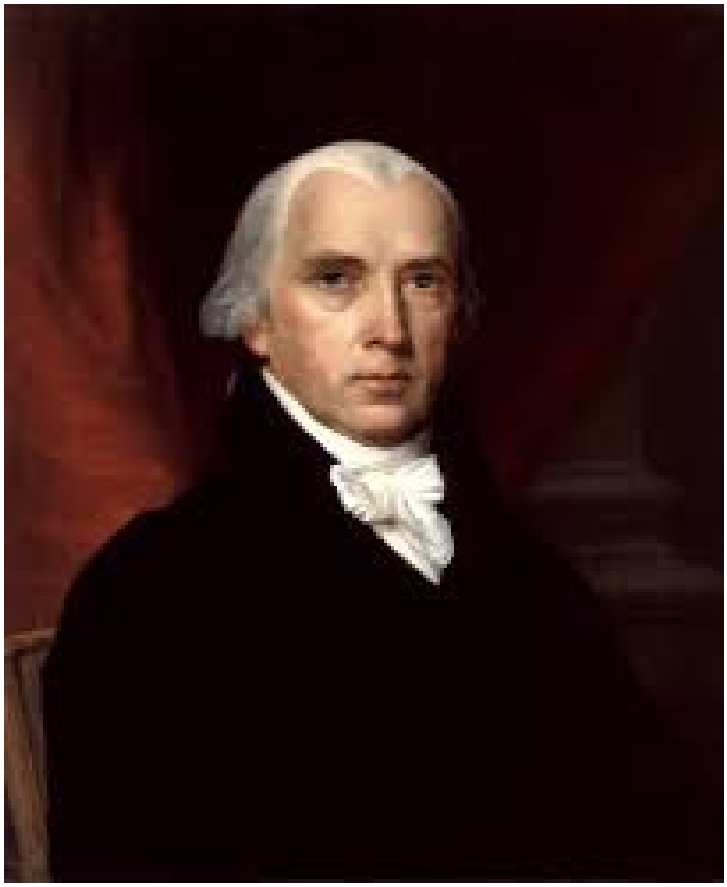


Figure 6.1: **James Madison, wrote that the more he reflected on the use of force, the more he doubted "the practicality, the justice and the efficacy of it when applied to people collectively, and not individually." He later introduced the Constitutional amendments that became the U.S. Bill of Rights.**

states based on the principle of confederation have proved to be too weak. Probably our best hope for the future lies in gradually reforming and strengthening the United Nations, until it becomes a federation.

In the case of the Federal Constitution of the United States, there were Anti-Federalists who opposed its ratification because they feared that it would be too powerful. Therefore, on June 8, 1789, James Madison introduced in the House of Representatives a series of 39 amendments to the constitution, which would limit the government's power. Of these, only amendments 3 to12 were adopted, and these have become known collectively as the Bill of Rights.

Of the ten amendments that constitute the original Bill of Rights, we should take particular notice of the First, Fourth and Sixth, because they have been violated repeatedly and grossly by the present government of the United States.

The First Amendment requires that "Congress shall make no law respecting an estab-

lishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances." The right to freedom of speech and freedom of the press has been violated by the punishment of whistleblowers. The right to assemble peaceably has also been violated repeatedly and brutally by the present government's militarized police.

The Fourth Amendment states that "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."It is hardly necessary to elaborate on the U.S. Government's massive violations of the Fourth Amendment. Edward Snowden's testimony has revealed a huge secret industry carrying out illegal and unwarranted searches and seizures of private data, not only in the United States, but also throughout the world. This data can be used to gain power over citizens and leaders through blackmail. True democracy and dissent are thereby eliminated.

The Sixth Amendment requires that "In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defense."This constitutional amendment has also been grossly violated.

In the context of federal unions of states, the Tenth Amendment is also interesting. This amendment states that "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."We mentioned above that historically, federations have been very successful. However, if we take the European Union as an example, it has had some problems connected with the principle of subsidiarity, according to which as few powers as possible should be decided centrally, and as many issues as possible should be decided locally. The European Union was originally designed as a free trade area, and because of its history commercial considerations have trumped environmental ones. The principle of subsidiarity has not been followed, and enlightened environmental laws of member states have been declared to be illegal by the EU because they conflicted with free trade. These are difficulties from which we can learn as we contemplate the conversion of the United Nations into a federation.

The United States Bill of Rights was influenced by John Locke and by the French philosophers of the Enlightenment. The French Declaration of the Rights of Man (August, 1789) was almost simultaneous with the U.S. Bill of Rights.

We can also see the influence of Enlightenment philosophy in the wording of the U.S. Declaration of independence (1776): "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.–That to secure these

rights, Governments are instituted among Men, deriving their just powers from the consent of the governed..."Another criticism that can be leveled against the present government of the United States is that its actions seem to have nothing whatever to do with the consent of the governed, not to mention the violations of the rights to life, liberty and the pursuit of happiness implicit in extrajudicial killings.

Here are a few things that Hamilton said:

Men give me credit for some genius. All the genius I have lies in this; when I have a subject in hand, I study it profoundly. Day and night it is before me. My mind becomes pervaded with it. Then the effort that I have made is what people are pleased to call the fruit of genius. It is the fruit of labor and thought.

Give all the power to the many, they will oppress the few. Give all the power to the few, they will oppress the many.

Those who stand for nothing fall for everything.

The art of reading is to skip judiciously.

There are seasons in every country when noise and impudence pass current for worth; and in popular commotions especially, the clamors of interested and factious men are often mistaken for patriotism.

Safety from external danger is the most powerful director of national conduct. Even the ardent love of liberty will, after a time, give way to its dictates. The violent destruction of life and property incident to war, the continual effort and alarm attendant on a state of continual danger, will compel nations the most attached to liberty to resort for repose and security to institutions which have a tendency to destroy their civil and political rights. To be more safe, they at length become willing to run the risk of being less free.

The sacred rights of mankind are not to be rummaged for among old parchments or musty records. They are written, as with a sunbeam, in the whole volume of human nature, by the Hand of Divinity itself, and can never be erased or obscured by mortal power.

Why has government been instituted at all? Because the passions of man will not conform to the dictates of reason and justice without constraint.

Hard words are very rarely useful. Real firmness is good for every thing. Strut is good for nothing.

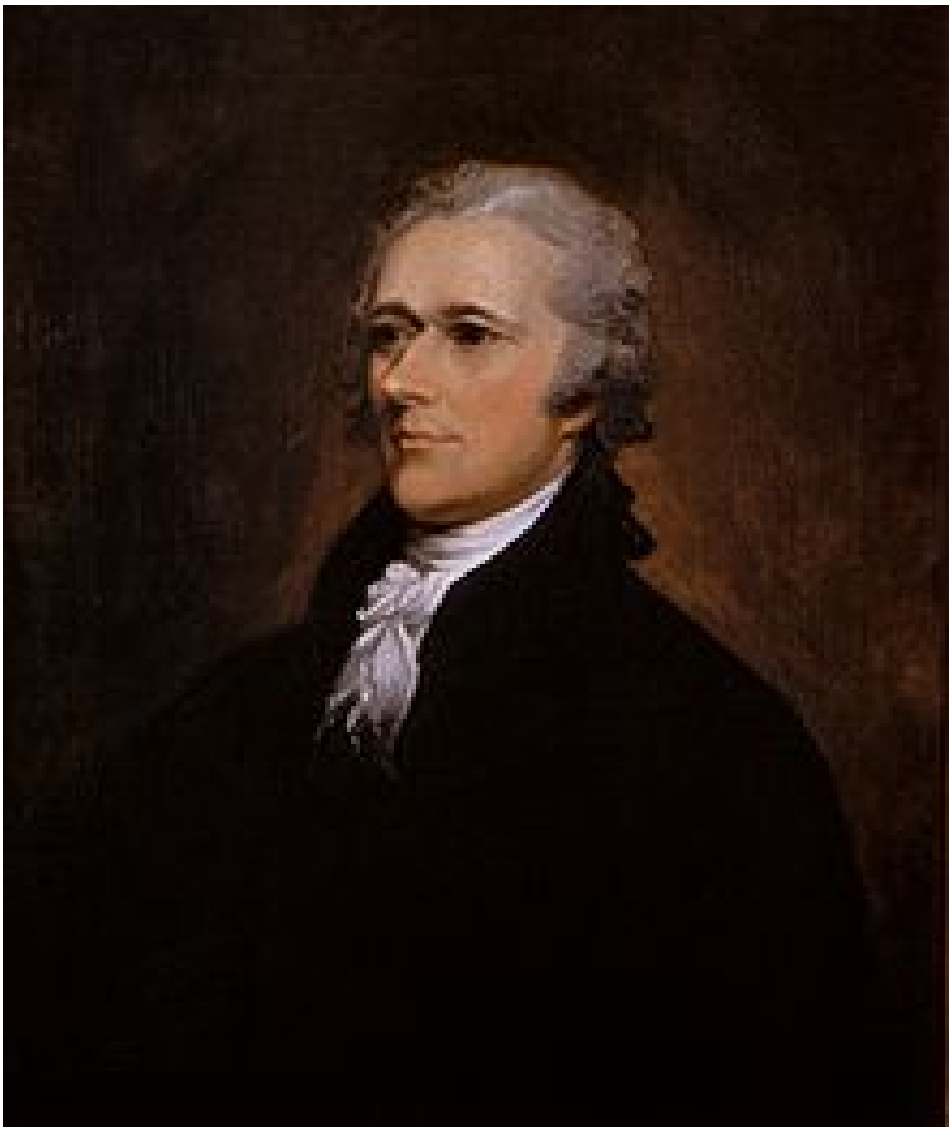


Figure 6.2: **Alexander Hamilton in a 1807 portrait by John Turnbull.**

I have thought it my duty to exhibit things as they are, not as they ought to be.

For in politics, as in religion, it is equally absurd to aim at making proselytes by fire and sword. Heresies in either can rarely be cured by persecution.

The republican principle demands that the deliberate sense of the community should govern the conduct of those to whom they intrust the management of their affairs; but it does not require an unqualified complaisance to every sudden breeze of passion or to every transient impulse which the people may receive from the arts of men, who flatter their prejudices to betray their interests.

Here, sir, the people govern; here they act by their immediate representatives.

Vigor of government is essential to the security of liberty.

It will be of little avail to the people, that the laws are made by men of their own choice, if the laws be so voluminous that they cannot be read, or so incoherent that they cannot be understood.

6.2 Thomas Paine

Early life

Thomas Paine was born in 1737 in Thetford, Norfolk, England. His father was a manufacturer of rope stays used on ships, and after attending grammar school, Paine was apprenticed to his father. Later, he held a variety of positions in England, including excise officer and school-teacher.

Paine also opened a tobacco shop, but it failed, and the resulting financial difficulties put Paine in danger of debtor's prison. He was saved from this fate by Benjamin Franklin, to whom he had been introduced by a fellow excise officer. Franklin suggested to Paine that he should emigrate to America, and he set sail in 1774.

Thomas Paine barely survived the voyage to America. The water on board had been polluted with typhoid fever, and when the ship arrived in Pennsylvania, Paine was so ill that he had to be carried ashore. Franklin's physician nursed the sick man back to health. Paine then became a citizen of Pennsylvania, and in 1775 he found work as editor of the *Pennsylvania Magazine*, a post which he filled with distinction.

Common sense, 1776

In Pennsylvania, Thomas Paine became an enthusiastic supporter American independence movement, and in 1776 he published an immensely successful pamphlet entitled *Common*

Sense. Ultimately half a million copies of this pamphlet were sold in the American colonies, whose population at that time was only 2.5 million. In proportion to the total population, Paine's pamphlet sold more copies than any printed work ever published in America, before or since.

Besides readers who owned copies of *Common Sense*, many others heard it read aloud in homes or taverns. The revolution against the English monarchy had already started, but Paine's pamphlet encouraged enlistment in George Washington's Continental Army and it supplied the the colonists with strong arguments for independence, Because of this, Paine is often called "the father of the American Revolution".

In his introduction to *Common Sense*, Paine wrote: "The cause of America is, to a great extent, the cause of all mankind. Many circumstances have, and will, arise, which are not local but universal, and through which principles all lovers of mankind are affected, and in the event of which their affections are interested. The laying of a country desolate with fire and sword, declaring war against the natural rights of all mankind, and extirpating the defenders thereof from the face of the earth, is the concern of every man to whom nature hath given the power of feeling; of which class, regardless of party censure, is the author."

In the main body of the pamphlet he opposed the idea that the English constitution is a good for America: "I know that it is difficult to get over long standing prejudices, yet if we suffer ourselves to examine the component parts of the English constitution, we shall find them to be the base remains of two ancient tyrannies, compounded with some new republican materials.
First: The remains of the monarchal tyranny in the person of the king.
Secondly: The remains of the aristocratical tyranny in the persons of the peers.
Thirdly: The new republican materials in the persons of the commons, on whose virtue depends the freedom of England."

"There is something exceedingly ridiculous in the composition of monarchy; it first excludes a man from the means of information, yet empowers him to act in cases where the highest judgement is required. The state of a king shuts him off from the world; yet the business of a king requires him to know it thoroughly; whereof the different parts, by opposing and destroying each other, prove the whole character to be absurd and useless."

"That the crown is the overbearing part of the English constitution, needs not be mentioned, and that it derives its whole consequence merely from being the giver of places and pensions is self-evident, whereof, although we have been wise enough to shut an lock a door against absolute monarchy, we at the same time have been foolish enough to put the crown in possession of the key."

The Rights of Man, (1791)

The Continental Congress sought financial help from France to support the revolutionary war against England. Thomas Paine was sent to France as one of two negotiators. He landed there in March 1781 and returned to America in August with 2.5 million livres in silver, as part of a "present" of 6 million and a loan of 10 million.

Paine returned to England in 1787 and he soon became involved a debate concerning the French Revolution. In 1790, the conservative writer Edmond Burke issued a pamphlet entitled *Reflections on the Revolution in France*. Burke's pamphlet was an argument for retaining traditional methods of government. Since they had evolved slowly and had been tested over long periods of time, Burke argued, traditional forms of government were more trustworthy than institutions that was newly invented.

Burke's pamphlet provoked a storm of refutations, and Thomas Paine joined the chorus with a pamphlet entitled *The Rights of Man*. He first offered this pamphlet to the liberal published Joseph Johnson. However, Johnson had been especially warned by government agents that if he printed anything by Paine, he would be speedily imprisoned. Paine himself was warned by William Blake that if he returned to his lodgings, he too would be imprisoned. Blake advised him to flee to France.

Before leaving for France, Paine entrusted *The Rights of Man* to another printer, J.S. Jordan, who risked arrest by publishing it. Nearly a million copies were sold! Details of the publication were handled by William Godwin, Thomas Brand Hollis and Thomas Holcroft, all of whom were close friends of Paine.

In England, Thomas Paine was tried *in absentia* for writing *The Rights of Man*, and he was convicted of seditious libel against the King. Of course he could not be arrested and hanged by the English government, because he was in France.

Despite not being able to speak French, Paine was elected to the French National Convention. However, France at that time was not a safe place, since rival revolutionary factions were fighting for control of the country. Paine was arrested in 1793 by Robespierre's party because he supported the rival Girondists After narrowly escaping execution, Paine was finally released from prison through the diplomatic efforts of the future American President, James Monroe. Thus Paine survived the critical days until the fall of Robespierre, after which he lived safely in France for a number of years.

In his 90,000-word book, *The Rights of Man*, Paine argued that human rights originate in Nature, thus, rights cannot be granted via political charter, because that implies that rights are legally revocable, hence, would be privileges:

"It is a perversion of terms", Paine wrote, "to say that a charter gives rights. It operates by a contrary effect - that of taking rights away. Rights are inherently in all the inhabitants; but charters, by annulling those rights, in the majority, leave the right, by exclusion, in the hands of a few... They... consequently are instruments of injustice ... The fact, therefore, must be that the individuals, themselves, each, in his own personal and sovereign right, entered into a contract with each other to produce a government: and this is the only mode in which governments have a right to arise, and the only principle on which they have a right to exist."

Thomas Paine argued that government's only purpose is safeguarding the individual's safety and inherent, inalienable rights; each societal institution that does not benefit the nation is illegitimate - especially monarchy and aristocracy.

Many of these ideas were already circulating during the Enlightenment period, for example in John Locke's *Second Treatise of Government*. Paine developed these ideas further, helped by conversations with Thomas Jefferson, who was also in Paris at that

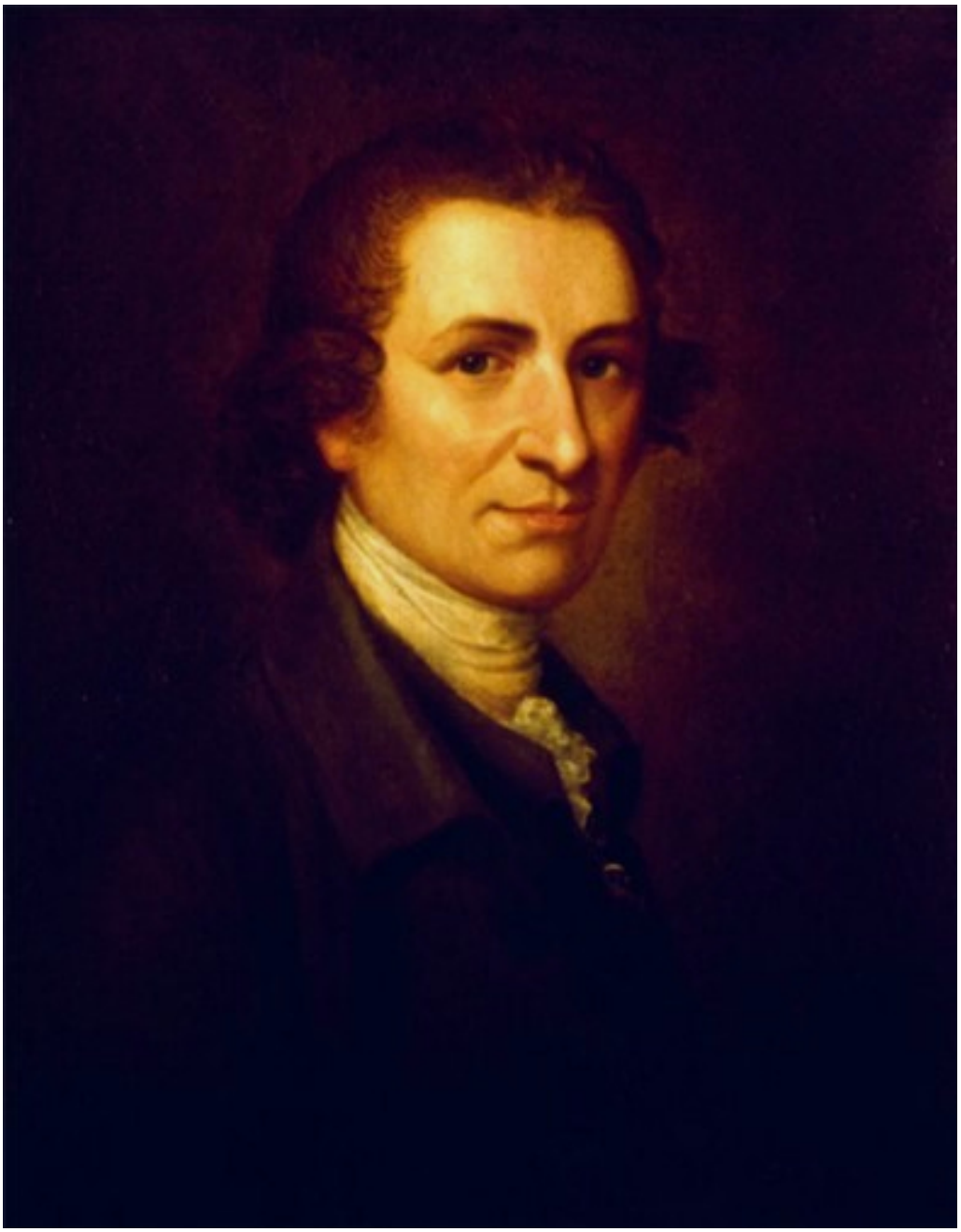


Figure 6.3: **Thomas Paine in a portrait by Mathew Pratt (Wikipedia).**

time.

In the final part of *The Rights of Man*, Paine proposes that a reformed English Constitution should be drafted, along the lines of the American Constitution. He advocated the elimination of aristocratic titles, a budget without military allocations, lower taxes and subsidized education for the poor, and a progressively weighted and increased income tax for the wealthy.

The Impact of Thomas Paine's Ideas

Napoleon claimed that he slept with a copy of Paine's *The Rights of Man* under his pillow. Napoleon was once friendly with Paine, but when he assumed the title of Emperor, Paine denounced him as a charlatan.

Abraham Lincoln's writing style was very much influenced by Paine's. Roy Basler, the editor of Lincoln's papers, said: "Paine had a strong influence on Lincoln's style: No other writer of the eighteenth century, with the exception of Jefferson, parallels more closely the temper or gist of Lincoln's later thought. In style, Paine above all others affords the variety of eloquence which, chastened and adapted to Lincoln's own mood, is revealed in Lincoln's formal writings."

Thomas Edison wrote: "I have always regarded Paine as one of the greatest of all Americans. Never have we had a sounder intelligence in this republic ... It was my good fortune to encounter Thomas Paine's works in my boyhood ... it was, indeed, a revelation to me to read that great thinker's views on political and theological subjects. Paine educated me, then, about many matters of which I had never before thought. I remember, very vividly, the flash of enlightenment that shone from Paine's writings, and I recall thinking, at that time, 'What a pity these works are not today the schoolbooks for all children!' My interest in Paine was not satisfied by my first reading of his works. I went back to them time and again, just as I have done since my boyhood days."

The Uriguaian national hero Jose Gervasio Artigas became familiar with and embraced Paine's ideas. In turn, many of Artigas's writings drew directly from Paine's, including the Instructions of 1813, which Uruguayans consider to be one of their country's most important constitutional documents; it was one of the earliest writings to articulate a principled basis for an identity independent of Buenos Aires.

Interestingly, like his lifelong friend and mentor Benjamin Franklin, Thomas Paine was also an inventor. Single-span iron bridges designed by him have been constructed in many parts of the world, and he contributed to the improvement of the steam engine.

In 2002, Paine was voted number 34 of "100 Greatest Britons" in a public poll conducted by the BBC.

6.3 Thomas Jefferson

Jefferson's Education

Thomas Jefferson (1743-1826) was born in the British Colony of Virginia. His father, Peter Jefferson, who was a planter and surveyor, died when Thomas Jefferson was 14 years old, and Thomas inherited an estate of approximately 5000 acres.

At the age of 16, Jefferson entered the College of William and Mary in Williamsburg Virginia. His studies there included mathematics and philosophy. He became familiar with John Locke, Francis Bacon and Isaac Newton. Jefferson also improved his knowledge of languages and his skill in playing the violin. He graduated in two years and afterwards studied law. Jefferson was an avid reader, hand his personal library ultimately included 6,500 books.

When the British government passed the Intolerable Acts in 1774, Jefferson wrote a resolution calling for a day of fating and prayer in protest, as well as a boycott of all British goods. He later expanded this into a larger publication with the title *A Summary View of the Rights of British America*.

Monticello

In 1768, Jefferson began construction his home, Monticello, on a hilltop overlooking his estate. It was a large mansion in the Paladian style, designed by Jefferson. He worked to improve it throughout most of his life. It is now a much-visited museum and national monument.

In 1772, Jefferson married his third cousin, the 23-year old widow Martha Wayles Skelton. The marriage was an extremely happy one, and they had six children. However, weakened by the birth of her last child, Martha died at the age of 33. Before her death she made her heartbroken husband promise never to marry again because she could not bear to think of her children being brought up by a stepmother. Through Martha, Jefferson inherited an additional estate of 11,000 acres, but he also inherited the debts of the estate, and this contributed to his financial worries. However, he was finally able to pay all of the debts.

Political service to Virginia and to the United States

At 33, Jefferson represented Virginia at the Continental Congress, where he was one of the youngest delegates. He was the main author of the *Declaration of Independence*. In writing it, he drew on his deep knowledge of Enlightenment thought, for example the writings of John Locke and Montaigne.

As a Virginia legislator, Jefferson drafted a law for religious freedom. He also served as Virginia's wartime governor (1779-1781).

In 1785, Jefferson became the United States' Minister to France. Later, from 1790 to 1793 he served as Secretary of State under President George Washington. He was America's

second Vice President, under John Adams. Finally, from 1801 to 1809 he served as the third President of the United States.

A few things that Thomas Jefferson said

I tremble for my country when I reflect that God is just; that his justice cannot sleep forever.

Educate and inform the whole mass of the people... They are the only sure reliance for the preservation of our liberty.

We hold these truths to be self-evident: that all men are created equal; that they are endowed by their Creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness.

Do you want to know who you are? Don't ask. Act! Action will delineate and define you.

I like the dreams of the future better than the history of the past.

I know of no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them but to inform their discretion.

The care of human life and happiness, and not their destruction, is the first and only object of good government.

I never considered a difference of opinion in politics, in religion, in philosophy, as cause for withdrawing from a friend.

All, too, will bear in mind this sacred principle, that though the will of the majority is in all cases to prevail, that will to be rightful must be reasonable; that the minority possess their equal rights, which equal law must protect, and to violate would be oppression.

Our country is now taking so steady a course as to show by what road it will pass to destruction, to wit: by consolidation of power first, and then corruption, its necessary consequence.

Sometimes it is said that man cannot be trusted with the government of himself. Can he, then be trusted with the government of others? Or have we found

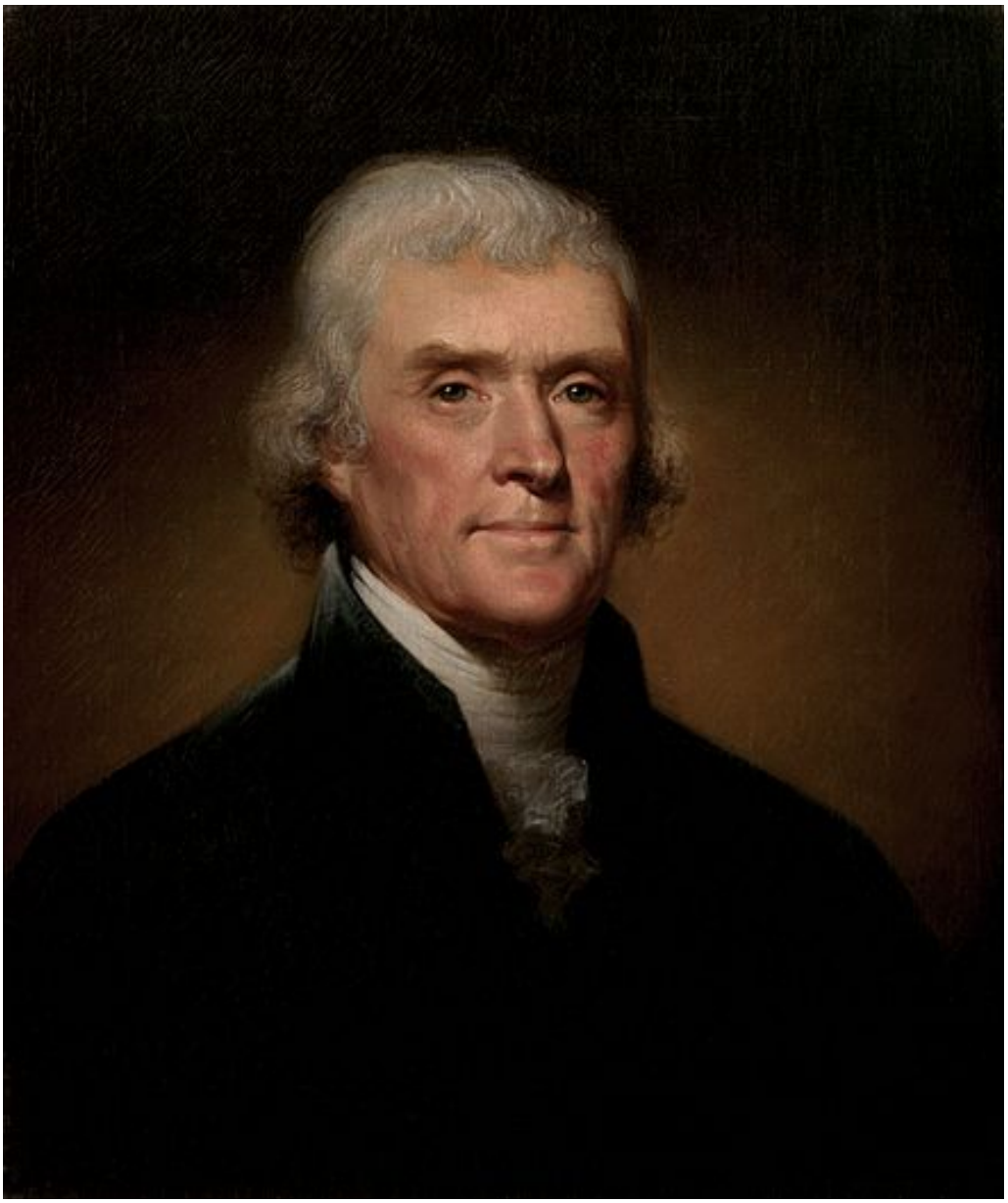


Figure 6.4: **Thomas Jefferson in a painting by R. Peale (Wikipedia).**

angels in the form of kings to govern him? Let history answer this question.

The world is indebted for all triumphs which have been gained by reason and humanity over error and oppression. Conquest is not in our principles. It is inconsistent with our government.

The spirit of this country is totally adverse to a large military force. I have seen enough of one war never to wish to see another.

I have sworn upon the altar of God, eternal hostility against every form of tyranny over the mind of man.

If there is one principle more deeply rooted in the mind of every American, it is that we should have nothing to do with conquest.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed...

6.4 Benjamin Franklin

From humble origins to international fame

Benjamin Franklin (1705-1790) was born in Boston to a father with seventeen children. Because of his very large family Franklin's father, who was a candle and soap maker, could only afford to send him to school for two years. Franklin was largely self-educated through voracious reading.

After leaving school, Benjamin Franklin at first worked for his father, but soon he was apprenticed to his elder brother James, who was a printer, and who also had founded a newspaper. *The New England Courant*, the first truly independent newspaper in the America Colonies.

Young Ben was already full of ideas, and he strongly wished to contribute articles to James' newspaper, but his somewhat tyrannical elder brother forbad him to do so. To get around this prohibition, Ben secretly invented a fictitious middle-aged widow named Silence Dogood, and submitted many articles in her name. These articles proved to be extremely popular with readers of *The New England Courant*, but when James discovered the ruse, he was furious.

The result of the soured relationship between the two brothers was that Benjamin Franklin broke off the apprenticeship without James' permission and fled to another colony,

Figure 6.5: **A portrait of Benjamin Franklin by Joseph Duplessis, 1778.**

Figure 6.6: **Franklin's kite experiment, as visualized by the artist Benjamin West, who added some cherubs. Franklin's kite experiment led him to invent the lightning rod. His other inventions included bifocal glasses, the glass harmonica and the Franklin stove. In science, Franklin was an early supporter of the wave theory of light; and he made important contributions to demographics, the study of ocean currents and the theory of electricity. He discovered the principle of conservation of electrical charge and constructed a multiple plate capacitor.**

Figure 6.7: **Franklin (center) at work with his printing press, in a reproduction of a painting by Charles Mills.**

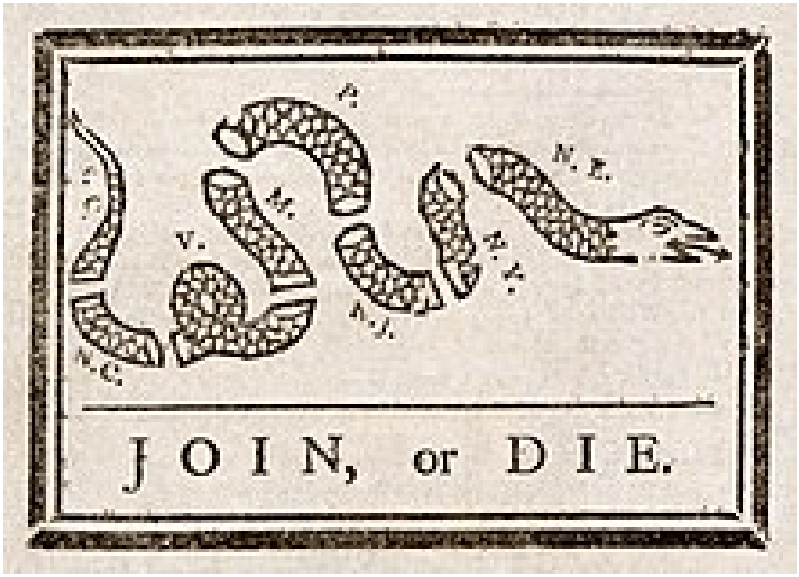


Figure 6.8: **A political cartoon by Benjamin Franklin urging the American colonies to unite.**

Figure 6.9: **A painting by John Turnbull showing the Committee of Five presenting the Declaration of Independence. Although illness made him unable to be present at the moment of presentation shown in the painting, Franklin made important contributions to the Declaration.**

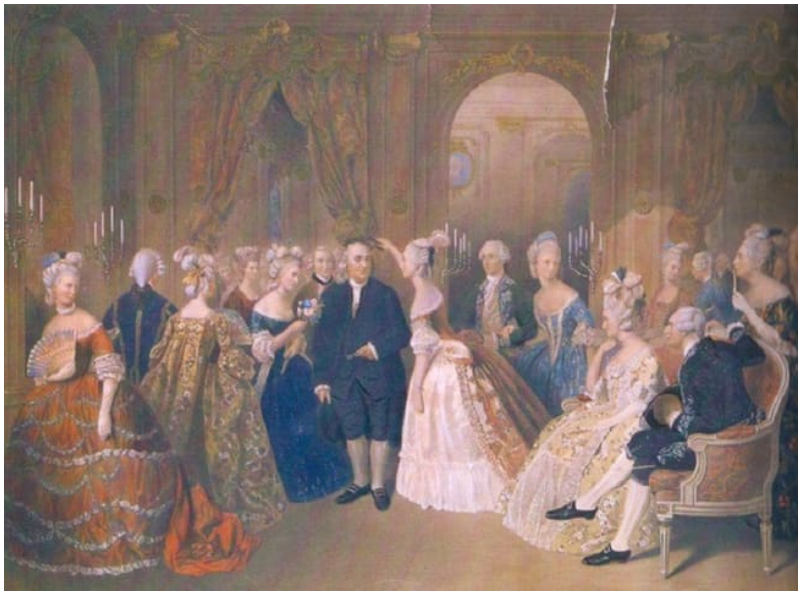


Figure 6.10: **A painting showing Franklin as Ambassador to France, surrounded by French ladies, with whom he was very popular. When one of them rebuked him for not having come to see her, he replied, "Madam, I am waiting until the nights are longer".**

Pennsylvania. He arrived there at the age of 17, almost penniless, but he soon found work in the printing shops of the newly-founded city of Philadelphia.

Before long, Benjamin Franklin became a highly successful independent printer, writer and publisher. His publications, such as *The Pennsylvania Gazette*, *Poor Richard's Almanac*, *The Busy-Body*, *The General Magazine and Historical Chronicle for all the British Plantations in America*, and *Abraham's Sermon*, eventually made him a wealthy man.

The Wikipedia article about Franklin states that he was "...an American polymath and one of the Founding Fathers of the United States. Franklin was a leading author, printer, political theorist, politician, freemason, postmaster, scientist, inventor, humorist, civic activist, statesman, and diplomat. As a scientist, he was a major figure in the American Enlightenment and the history of physics for his discoveries and theories regarding electricity. As an inventor, he is known for the lightning rod, bifocals, and the Franklin stove, among other inventions. He founded many civic organizations, including the Library Company, Philadelphia's first fire department and the University of Pennsylvania.

"Franklin earned the title of 'The First American' for his early and indefatigable campaigning for colonial unity, initially as an author and spokesman in London for several colonies. As the first United States Ambassador to France, he exemplified the emerging American nation. Franklin was foundational in defining the American ethos as a marriage of the practical values of thrift, hard work, education, community spirit, self-governing institutions, and opposition to authoritarianism both political and religious, with the scientific and tolerant values of the Enlightenment."

Here are a few things that Benjamin Franklin said:

They who can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety.

Three may keep a secret, if two of them are dead.

Either write something worth reading or do something worth writing [about].

Tell me and I forget, teach me and I may remember, involve me and I learn.

He that can have patience can have what he will.

A Penny Saved is a Penny Earned.

You may delay, but time will not.

Many people die at twenty five and aren't buried until they are seventy five.

Never ruin an apology with an excuse.

We are all born ignorant, but one must work hard to remain stupid.

Justice will not be served until those who are unaffected are as outraged as those who are.

By failing to prepare, you are preparing to fail.

How many observe Christ's birthday! How few, His precepts!

Well done is better than well said.

Hide not your talents, they for use were made, What's a sundial in the shade?

Being ignorant is not so much a shame, as being unwilling to learn.

An investment in knowledge always pays the best interest

Lost Time is never found again.

It is the first responsibility of every citizen to question authority.

Instead of cursing the darkness, light a candle.

If all printers were determined not to print anything till they were sure it would offend nobody, there would be very little printed.

The Constitution only guarantees the American people the right to pursue happiness. You have to catch it yourself.

Be at war with your vices, at peace with your neighbors, and let every new year find you a better man.

Chapter 7

THE FRENCH REVOLUTION

7.1 The French philosophers and the Encyclopedia

Diderot and d'Alembert

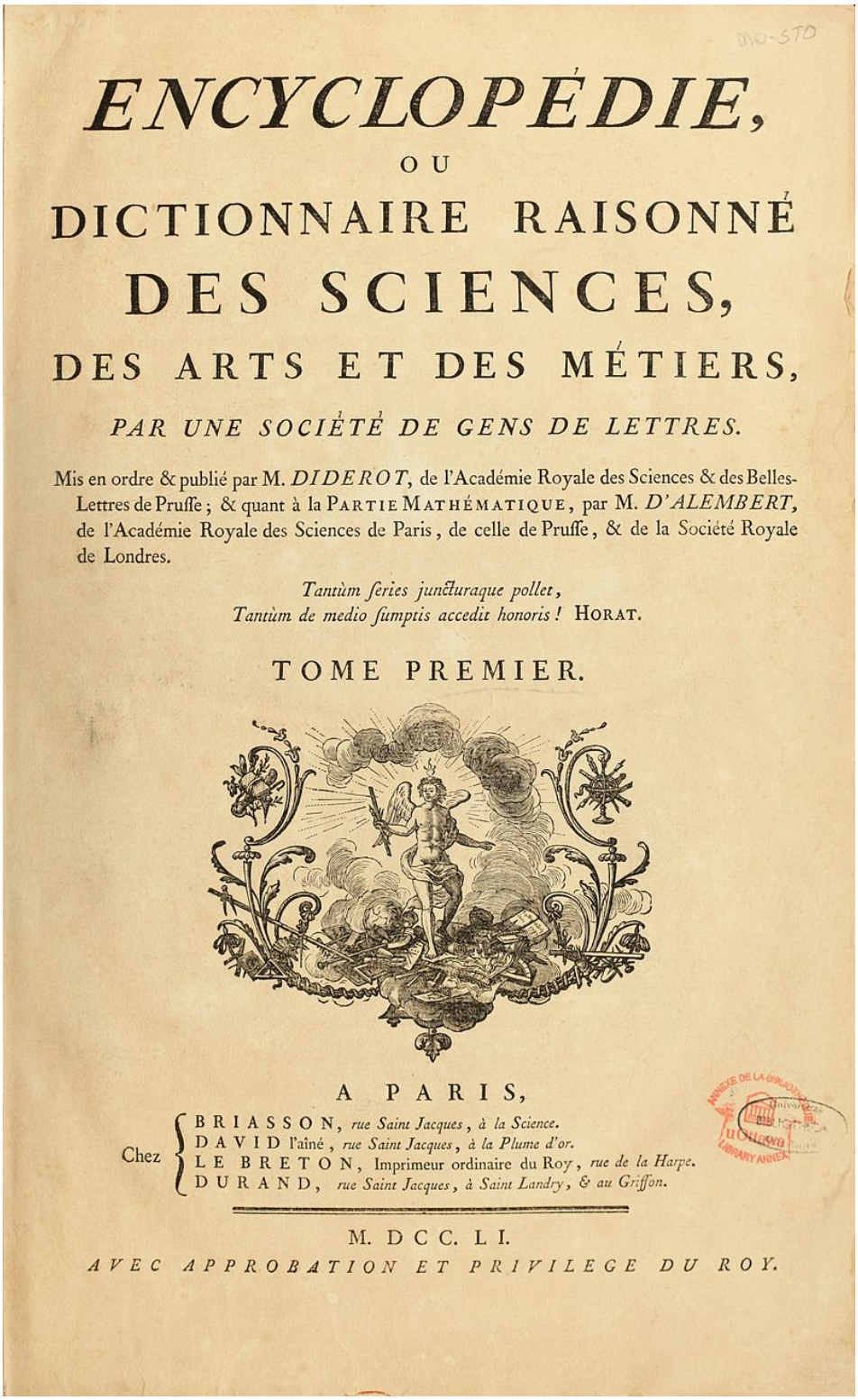
Denis Diderot (1713-1784) and Jean le Rond d'Alembert (1717-1783) were the two main editors of the French *Encyclopédie* (Encyclopedia). The orderly cosmos of Isaac Newton had initiated an Age of Reason, or Enlightenment, and the editors of the *Encyclopédie* hoped that the spread of knowledge would also initiate social reforms. D'Alembert, an eminent mathematician, edited the scientific articles, while Diderot edited all the others.

The philosophers laid the groundwork for the French Revolution

The philosophers of 18th century France laid the groundwork for the French Revolution. They demonstrated the "the divine right of kings" was just a superstition, and that therefore a m ore rational form of government was both possible and desirable.

The ideals of the Revolution were *Liberty, Égalité, et Fraternité*, Liberty, Equality and Brotherhood. Many, both in France and in other countries, sympathized with these ideals. Sadly, the French Revolution in its later stages, degenerated into a Reign of Terror.

Figure 7.1: **Denis Diderot.**



ENCYCLOPÉDIE,

OU

DICTIONNAIRE RAISONNÉ DES SCIENCES,

DES ARTS ET DES MÉTIERS,

PAR UNE SOCIÉTÉ DE GENS DE LETTRES.

Mis en ordre & publié par M. *DIDEROT*, de l'Académie Royale des Sciences & des Belles-Lettres de Prusse; & quant à la PARTIE MATHÉMATIQUE, par M. *D'ALEMBERT*, de l'Académie Royale des Sciences de Paris, de celle de Prusse, & de la Société Royale de Londres.

Tantùm series junctúraque pollet,
Tantùm de medio sumptis accedit honoris! HORAT.

TOME PREMIER.

A PARIS,

Chez
BRIASSON, *rue Saint Jacques, à la Science.*
DAVID l'aîné, *rue Saint Jacques, à la Plume d'or.*
LE BRETON, Imprimeur ordinaire du Roy, *rue de la Harpe.*
DURAND, *rue Saint Jacques, à Saint Landry, & au Griffon.*

M. DCC. LI.

AVEC APPROBATION ET PRIVILEGE DU ROY.

Figure 7.2: **Title page of the *Encyclopédie*.**

Figure 7.3: ***Un diner de philosophes*** **painted by Jean Huber. Denis Diderot is the second from the right (seated).**

Figure 7.4: **Jean le Rond d'Alembert (1717-1783).**

Figure 7.5: **Portrait of Jean Le Rond d'Alembert, 1777, by Catherine Lusurier.**

7.2 The storming of the Bastille

The Bastille was a fortress in Paris, which acted both as a prison and also as a storage place for weapons, gunpowder and ammunition. It was thus a symbol of the power of the monarchy. On the 14th of July, 1789, the Bastille was stormed and taken over by angry Parisians, with much loss of life. The event marked the start of the French Revolution.

The background for the storming of the Bastille and the reason for the anger of the people was a financial crisis in France, produced by poor harvests, the expense of supporting the American Revolution, and the unfair system of taxation.

On the 17th of June, 1789, the Third Estate, whose representatives were drawn from the commoners, met at what they named The National Assembly, with the purpose of drawing up a constitution for France. Paris was close to insurrection, and, in the words of a contemporary observer, "intoxicated with liberty and enthusiasm". The result was the storming of the Bastille, marking the start of the French Revolution.

7.3 Why the French Revolution did not spread to England

In England, the government reacted savagely and brutally against all liberal ideas. In 1798, Napoleon's armies were victorious on the continent, and the French were massing their forces for an invasion of England. Napoleon believed that the ordinary people of England would welcome him as a liberator and, in fact, the English government was facing a mutiny in its own navy, massive riots, and rebellion in Ireland. The Establishment was fighting for its life and was not in the mood to make fine distinctions about whether the blows that it struck were above or below the belt.

Pitt and Grenville had already introduced the "Gagging Acts", which effectively put an end to freedom of speech and assembly. The government now sponsored, by means of a secret subsidy, the *Anti-Jacobin Review*, a periodical which savagely attacked all of the leading liberals in turn, including both William Godwin and Mary Wollstonecraft.

Pitt's government also decided that a few hangings were needed to damp the enthusiasm for liberal ideas. William Godwin's close friends in the reform movement, Hardy, Thelwall and Horne Tooke were threatened with hanging. Godwin saved them by writing a closely reasoned legal article in which he argued that in broadening the interpretation of high treason without precedent, the government was, in effect, creating a new law and judging the prisoners *ex post facto*.

England came close to revolution, but, by means of savage repression of liberal ideas, Pitt's government succeeded in holding onto power.

Figure 7.6: **Marie Antoinette, Queen of France, with her three eldest children.**

Figure 7.7: **Louis XVI in early adulthood.**

Figure 7.8: **Storming of the Bastille.**

Figure 7.9: **The French Revolution, a romanticized painting.**

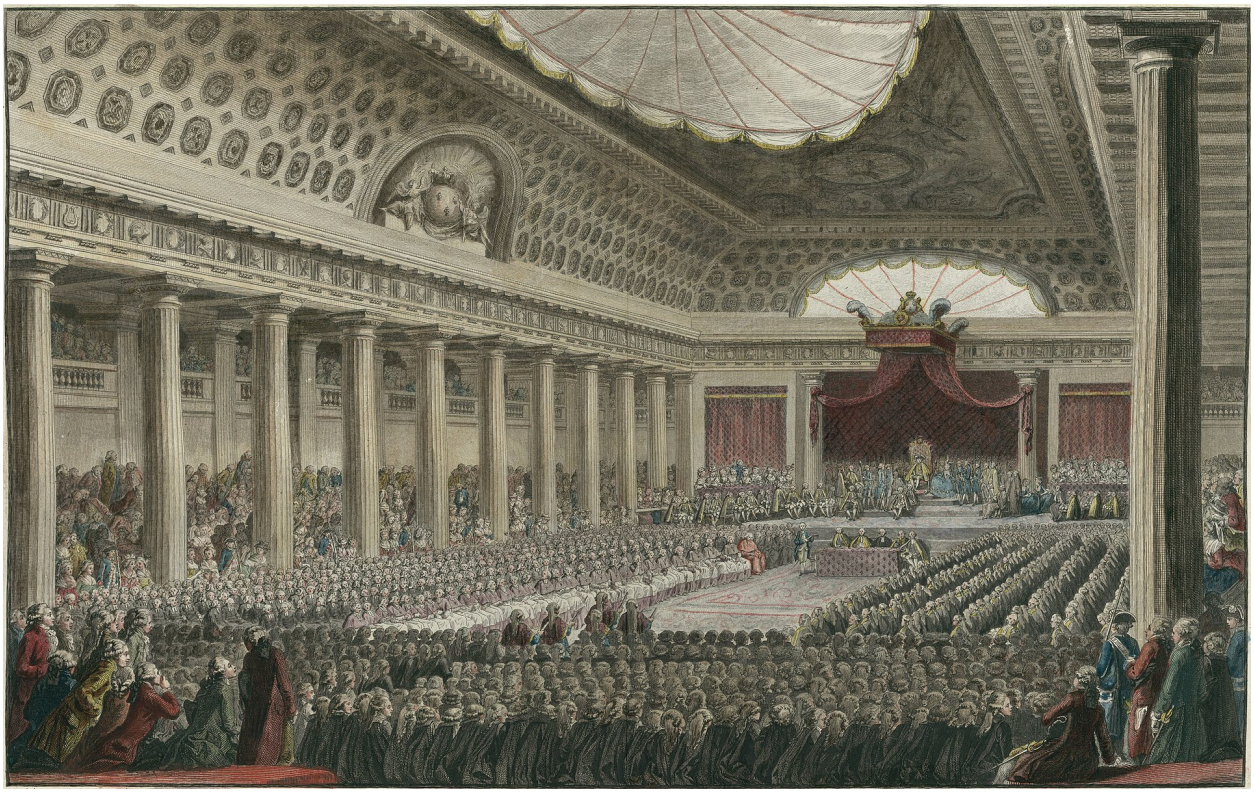


Figure 7.10: **Meeting of the Estates General on 5 May 1789 at Versailles.**

Figure 7.11: **The storming of the Tuileries Palace, 10 August 1792.**

Figure 7.12: **Execution of Louis XVI in the Place de la Concorde, facing the empty pedestal where the statue of his grandfather, Louis XV previously stood.**

Figure 7.13: **The Death of Marat by Jacques-Louis David (1793). Jean-Paul Marat (1743-1793) was a French physician, scientist and journalist who fiercely advocated basic human rights for the poorest segment of society. He was murdered while taking a medicinal bath.**

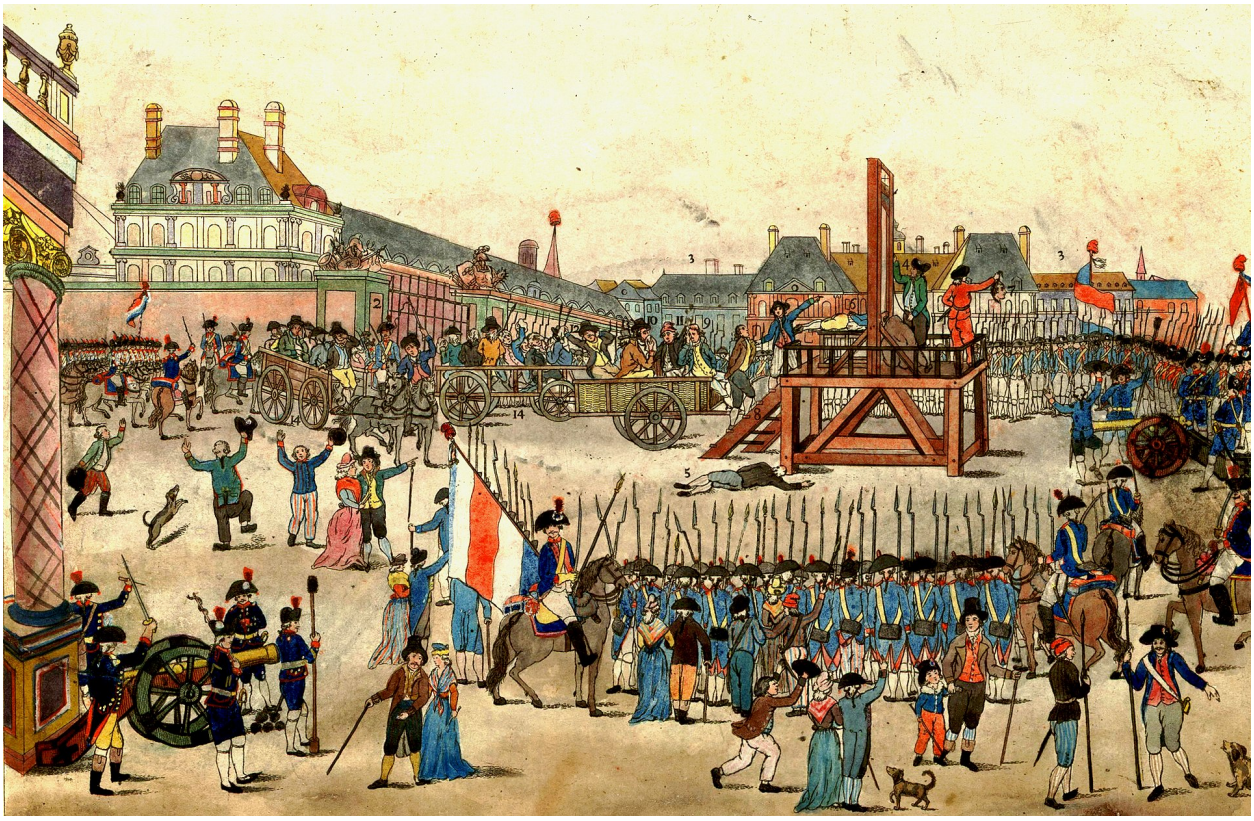


Figure 7.14: **The execution of Robespierre on 28 July 1794 marked the end of the Reign of Terror.**

Figure 7.15: **The statesman and Member of Parliament Edmond Burke wrote a pamphlet entitled *Reflections on the Revolution in France*, arguing that traditional governments are the best. It provoked a storm of counter-arguments from authors in England who advocated change, and even radical change. The government of England then adopted extremely harsh measures to suppress the radical voices. and the French Revolution was not repeated in England.**

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Chapter 8

HANDEL, HAYDEN, MOZART AND BEETHOVEN

8.1 Handel

George Frederick Handel (1685-1759) was born in Halle, Germany. Initially, his father was violently opposed to a musical career for his son. There is a story of the young boy secretly taking a small clavichord to an attic room in the family's large house, and practicing on it when the others were asleep.

When the George Frederick Handel was between seven and nine years old, he accompanied his father to Weissenfels, where he was noticed by Duke Johann Adolf I. Somehow the boy found his way to the organ of the palace chapel, where he surprised and impressed everyone with his playing. Duke Johann then recommended to Handel's father that the boy should be given a musical education. It was more than a recommendation. It was a command!

Handel moves to England

In 1710, at the age of 25, Handel became Kapelmeister to Prince George, the Elector of Hanover, who became King George I of Great Britain and Ireland in 1714. Handel accompanied Prince George to England, and decided to remain there permanently.

Operas, Water Music and the Messiah

While in England, Handel composed and produced very many operas, oratorios, his famous Water Music, and the even more famous Messiah. Handel arranged a performance of the Messiah to benefit the ChildrenÃ¸s Foundling Home. The benefit concerts for the home continued with great success, and became a tradition.

When Handel died in 1759, he was both rich and famous. He was given a state funeral in Westminster Abby.

Figure 8.1: **Handel House, birthplace of Handel.**

Figure 8.2: **George Frederic Handel by Balthasar Denner.**

Figure 8.3: **Handel (center) and King George I on the River Thames, 17 July 1717.**

Figure 8.4: **A painting of Handel by Philip Mercier (1730).**

8.2 Hayden

Childhood employment as a choirboy

Franz Joseph Hayden (1732-1809) has been called "the father of the symphony". and "the father of the string quartet". He was born in a small village on the border between Austria and Hungary. His parents recognized their son's outstanding musical ability when he was very young, but their financial situation at first prevented them from helping him to study music. However, when Hayden was six years old, he was apprenticed to a relative named Frankh, who was a schoolmaster and choirmaster. The young Hayden began his musical training there. His singing as a choirboy was so impressive that he was brought to the attention of Georg von Reutter, the musical director of St. Steven's Cathedral in Vienna. Hayden moved to Vienna in 1740, and worked there for the next nine years. The choirboys at St. Steven's Cathedral were instructed in school subjects such as Latin, and in voice, violin and keyboard.

Hayden's nine years at St. Steven's Cathedral ended abruptly after his ninth year. His voice was changing, and he could no longer sing the high notes properly. Then, as a prank, he cut off the pigtail of a fellow choirboy. This was too much for Georg von Reutter, who immediately fired Hayden.

Luckily Hayden was taken in and cared for by friends while he searched for other employment. Hayden worked at a variety of freelance musical jobs, one of which was employment as the valet-accompanist for the Italian composer, Nicola Porposa, from whom he learned the fundamentals of musical composition. To increase his knowledge of the techniques of composition, he also diligently studied the works of Carl Philip Emanuel Bach.

Growing fame as a composer

Hayden's first success as a composer was the comic opera *Der krumme Teufel* (The Limping Devil). He continued to study compositional techniques, and produced many more musical works. Because of his growing reputation, Countess Thun engaged him as her singing and keyboard teacher.

In 1756 Hayden (then 24 years old) was employed by Baron Karl Josef Fürnberg at his country estate. Here Hayden wrote his first string quartets. They were enormously successful, and they marked a turning point in his career.

In 1757, Hayden was employed as Kapelmeister by Count Morzin, and in this position he wrote his first symphonies.

Kapelmeister for the Esterházys

Count Morzin encountered financial difficulties which forced him to disband his musical establishment, including his Kapelmeister (Director of Music) Joseph Hayden. However, Hayden was quickly offered a similar position by the immensely rich Prince Paul Anton

Esterházy. Hayden went to live at the Esterházy family's palace in the remote Hungarian countryside, far from the influences of the Vienna musical scene. Hayden remained there for the next thirty years, and since his initial contract did not allow him to travel, he was forced to develop his own, very original, musical style.

Europe's most popular composer

When Joseph Hayden's original contract with the Esterházys ran out in 1779, he was able to negotiate a new contract that allowed him much more freedom. He was not only free to travel during part of the year, but crucially, also free to sell his compositions to publishers. He began to write fewer operas and more symphonies and chamber music. He sold these compositions to publishers. Often he sold the same composition several times to publishers in different countries. The great success of these compositions made him the most popular composer in Europe.

Friendship with Mozart

In about 1784, Hayden met Wolfgang Amadeus Mozart. They plated in string quartets together, and admired each other's work. Hayden and Mozart admired and praised each other's work unstintingly, and they became fast friends.

Hayden in England

In 1790, Prince Nackolaus Esterházy died, and was succeeded by his son, Prince Anton, who sought to economize by dismissing most of the court musicians. Hayden retained a nominal position, with a reduced salary, and few duties. He was thus free to travel, and he made two trips to England, where his music was so popular that there was hardly a concert without the performance of at least one of his works.

Charles Burney, reviewing Hayden's first concert in England, wrote: "Haydn himself presided at the piano-forte; and the sight of that renowned composer so electrified the audience, as to excite an attention and a pleasure superior to any that had ever been caused by instrumental music in England." The success of his concerts in England made Hayden financially independent. He repeated the journey with equal success in 1794-1795.

Beethoven's teacher

While traveling to London in 1790, Hayden met Ludwig van Beethoven in Bonn. He took Beethoven with him to Eisenstadt for the summer. Hayden spent the summer teaching Beethoven some of the elements of counterpoint and other techniques on composition.

Figure 8.5: **Portrait of Joseph Haydn by Thomas Hardy (1791).**

Figure 8.6: **Prince Nikolaus Esterházy, Haydn's most important patron.**

Figure 8.7: **Haydn as portrayed by John Hoppner in England in 1791.**

8.3 Mozart

The most spectacular child prodigy in musical history

Mozart's elder sister Nannerl recalled that "In the fourth year of his age his father, for a game as it were, began to teach him a few minuets and pieces at the clavier. ... He could play it faultlessly and with the greatest delicacy, and keeping exactly in time. ... At the age of five, he was already composing little pieces, which he played to his father who wrote them down."

In 1762, when Mozart was six years old, he and Nannerl were already performing before European royalty as child prodigies.

More than 600 works in every genre

Although he died at the early age of 35, Mozart left a huge body of musical works, which greatly influenced other composers. Among his 22 operas, are the well loved and frequently performed Le nozze di Figaro, K. 492 (1786), Don Giovanni, K. 527 (1787), Cosi fan tutte, K. 588 (1790), and Die Zauberflöte, K. 620 (1791).

Friendship with Hayden. Influence on Beethoven

Hayden and Mozart were close friends, and they greatly admired each other's work. In 1785, Hayden told Mozart's father. "I tell you before God, and as an honest man, your son is the greatest composer known to me by person and repute, he has taste and what is more the greatest skill in composition."

Beethoven was influenced by Mozart's compositions, and wanted to study with him, but there is no record of the two great composers ever having met.

Figure 8.8: **Anonymous portrait of the child Mozart.**

Figure 8.9: **Mozart aged 14 in January 1770 (School of Verona, attributed to Giambettino Cignaroli).**

Figure 8.10: **Mozart, in 1781, detail from portrait by Johann Nepomuk della Croce.**

Figure 8.11: **Mozart wearing the badge of the Order of the Golden Spur which he received in 1770 from Pope Clement XIV in Rome. The painting is a 1777 copy of a work now lost.**

8.4 Beethoven and Napoleon

Beethoven's 5th symphony is one of the most famous works in the history of music. It contains the dot-dot-dot-dash theme that was used in World War II to symbolize the Morse code for V, meaning Victory for the Allies in their struggle against Hitler. The theme has variously been interpreted as Fate, knocking on the door, or Beethoven, railing against his increasing deafness. But recent research points to another interpretation: The famous dot-dot-dot-dash theme of Beethoven's 5th symphony, both in rhythm and in tones, echos a revolutionary song with the words "Nous jourons tous, le fer en main!"

According to a recent article[1], " ...those first four notes, once heard, are never forgotten. The traditional wisdom has been that in the Fifth, Beethoven is railing against fate and his increasing deafness. But conductor John Eliot Gardiner believes that it contains a hidden, radical message. Expressing the composer's sympathy with the ideals of the French Revolution. Liberty, equality and brotherhood. It's not just a matter of his expressing his inner turmoil, it's also him nailing his colours to the political mast of the French Revolution. 'I believe in the rights of man, I believe in the brotherhood of all men.'"

When he composed his 5th symphony, Beethoven was living in Vienna, and the highly reactionary Austrian government would have arrested him if they had known the hidden meaning of the 5th symphony's famous theme. The French Revolution was followed by a period of reaction, during which the monarchies of Europe all united to overthrow the revolutionary government of France. Beethoven initially saw Napoleon as a defender of the ideals of the Enlightenment, and he dedicated his 3rd symphony to Napoleon. However, when Napoleon crowned himself as Emperor, Beethoven tore up the dedication in rage and disillusion. Napoleon, with his invasion of Russia, proved himself to be a megalomaniac, indifferent to the loss of innocent lives. The French Revolution itself degenerated into an orgy of violence and killing. Nevertheless, the ideals of the Enlightenment, the ideals that inspired Beethoven, can inspire us today.

[1] https://subsaga.com/bbc/documentaries/music/2016/the-secret-of-beethovens-fifth-symphony.html

Figure 8.12: **Beethoven, a revolutionary in music, was profoundly sympathetic with the ideals of freedom, equality and brotherhood which inspired the French Revolution.**

Figure 8.13: **Revolutionary France. Although at its start it embraced the ideals of the Enlightenment, the French Revolution later degenerated into an orgy of bloodshed, Robespierre's "Terror".**

Figure 8.14: **Portrait of Beethoven as a young man.**

Figure 8.15: **Portrait by Joseph Karl Stieler.**

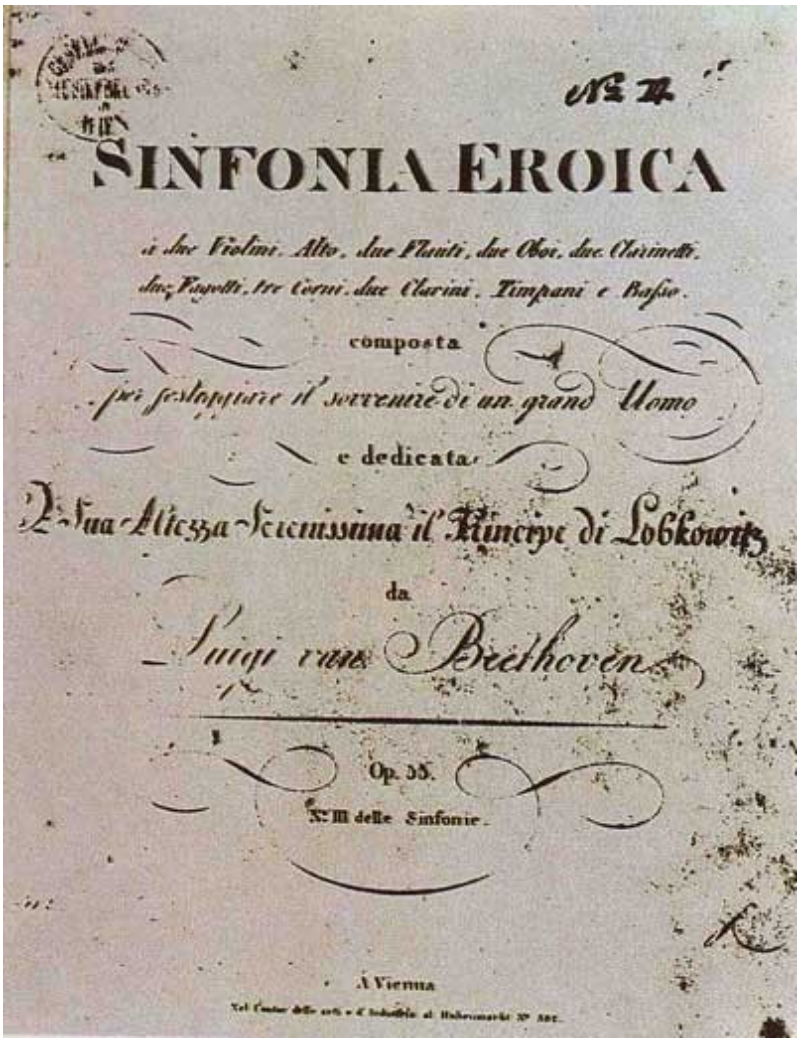

Figure 8.16: **Beethoven's Third Symphony was originally dedicated to Napoleon; but when Napoleon crowned himself as Emperor, Beethoven was filled with rage and disillusion, and he tore up the dedication.**

Figure 8.17: **Napoleon's retreat from Moscow. Napoleon showed himself to be totally self-centered and indifferent to human suffering and death as long as it served his personal ambitions.**

Figure 8.18: **An old, disheveled and completely deaf Beethoven, conducting his great 9th Symphony. The ideals of the Enlightenment remain to inspire us today. In Beethoven's choral symphony, his great music combined with Schiller's words give today's world an anthem of universal human solidarity: All men and women are brothers and sisters! Not just some but all! All!**

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Chapter 9

LINNAEUS

9.1 Linnaeus

During the 17th and 18th centuries, naturalists had been gathering information on thousands of species of plants and animals. This huge, undigested heap of information was put into some order by the great Swedish naturalist, Carl von Linné (1707-1778), who is usually called by his Latin name, Carolus Linnaeus.

Linnaeus was the son of a Swedish pastor. Even as a young boy, he was fond of botany, and after medical studies at Lund, he became a lecturer in botany at the University of Uppsala, near Stockholm. In 1732, the 25-year-old Linnaeus was asked by his university to visit Lapland to study the plants in that remote northern region of Sweden.

Figure 9.1: The great Swedish naturalist Carolus Linnaeus developed a language which is now universally used for biological classification.

9.2 The language of Linnean classification

Linnaeus travelled four thousand six hundred miles in Lapland, and he discovered more than a hundred new plant species. In 1735, he published his famous book, *Systema Naturae*, in which he introduced a method for the classification of all living things.

Linnaeus not only arranged closely related species into genera, but he also grouped related genera into classes, and related classes into orders. (Later the French naturalist Cuvier (1769-1832) extended this system by grouping related orders into phyla.) Linnaeus introduced the binomial nomenclature, still used today, in which each plant or animal is given a name whose second part denotes the species while the first part denotes the genus.

Linneaus proposed three kingdoms, which were divided into classes. From classes, the groups were further divided into orders, families, genera (singular: genus), and species. An additional rank beneath species distinguished between highly similar organisms. While his system of classifying minerals has been discarded, a modified version of the Linnaean classification system is still used to identify and categorize animals and plants.

Although he started a line of study which led inevitably to the theory of evolution, Linnaeus himself believed that species are immutable. He adhered to the then-conventional view that each species had been independently and miraculously created six thousand years ago, as described in the Book of Genesis.

Linnaeus did not attempt to explain why the different species within a genus resemble each other, nor why certain genera are related and can be grouped into classes, etc. It was not until a century later that these resemblances were understood as true family likenesses, so that the resemblance between a cat and a lion came to be understood in terms of their descent from a common ancestor[1].

[1] Linnaeus was to Darwin what Kepler was to Newton. Kepler accurately described the motions of the solar system, but it remained for Newton to explain the underlying dynamical mechanism. Similarly, Linnaeus set forth a descriptive "family tree" of living things, but Darwin discovered the dynamic mechanism that underlies the observations.

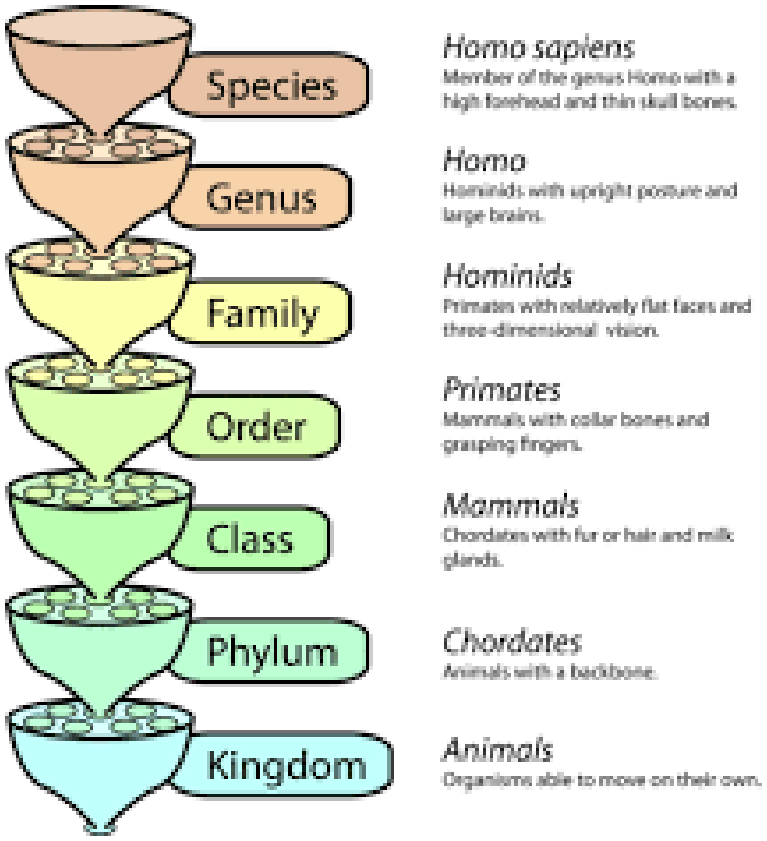


Figure 9.2: The branching decision-trees in the Linnean language of classification resembles the decision-trees in package-address systems such as postal systems of the Internet. Similar decision-trees are found when an animal finds its way through forest or maze.

Figure 9.3: Within the Animal kingdom, the polar bear belongs to the phylum Chordata, the class Mammalian, the order Carnivore, the family Ursidia, the genus Ursus, and the species Ursus arctus.

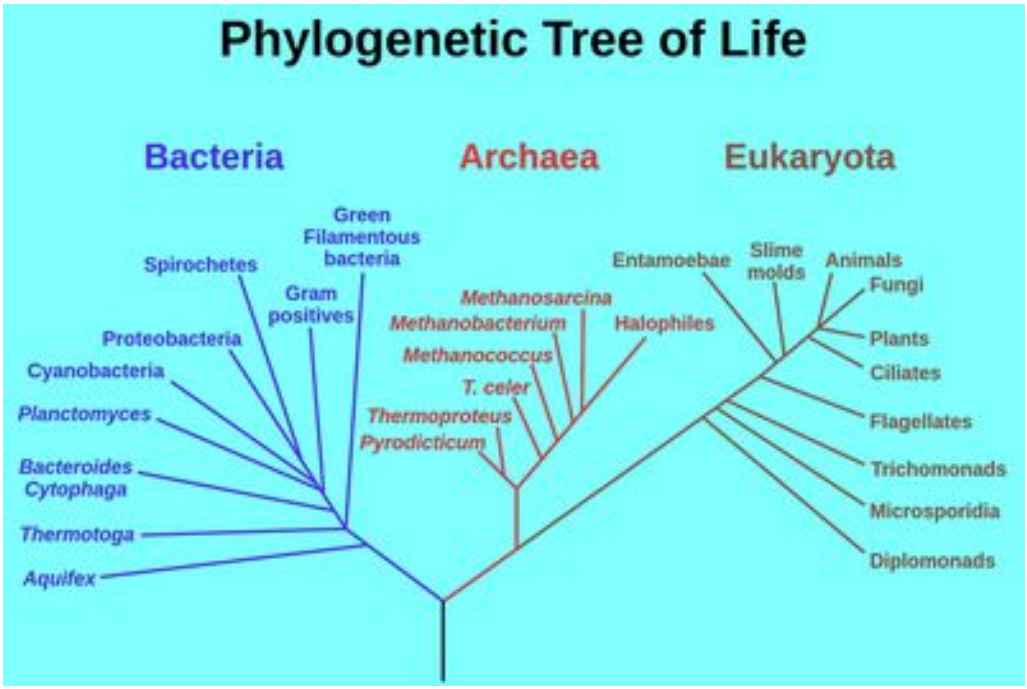


Figure 9.4: The three-domain system currently used to classify living organisms. Within each domain, the classification becomes progressively finer: From classes, the groups were further divided into orders, families, genera (singular: genus), and species. An additional rank beneath species distinguished between highly similar organisms. While his system of classifying minerals has been discarded, a modified version of the Linnaean classification system is still used to identify and categorize animals and plants.

Kingdoms and classes

Animals

1. Mammalian (mammals)
2. Aves (birds)
3. Amphibia (amphibians)
4. Pisces (fish)
5. Insecta (insects)
6. Vermes (worms)

Plants

1. Monandria: flowers with 1 stamen
2. Diandria: flowers with 2 stamens
3. Triandria: flowers with 3 stamens
4. Tetrandria: flowers with 4 stamens
5. Pentandria: flowers with 5 stamens
6. Hexandria: flowers with 6 stamens
7. Heptandria: flowers with 7 stamens
8. Octandria: flowers with 8 stamens
9. Enneandria: flowers with 9 stamens
10. Decandria: flowers with 10 stamens
11. Dodecandria: flowers with 12 stamens
12. Icosandria: flowers with 20 (or more) stamens
13. Polyandria: flowers with many stamens
14. Didynamia: flowers with 4 stamens, 2 long and 2 short
15. Tetradynamia: flowers with 6 stamens, 4 long and 2 short
16. Monadelphia; flowers with the anthers separate, but the filaments united at the base
17. Diadelphia; flowers with the stamens united in two groups

18. Polyadelphia; flowers with the stamens united in several groups

19. Syngenesia; flowers with 5 stamens having anthers united at the edges

20. Gynandria; flowers having stamens united to the pistils

21. Monoecia: monoecious plants

22. Dioecia: dioecious plants

23. Polygamia: polygamodioecious plants

24. Cryptogamia: organisms that resemble plants but don't have flowers, which included fungi, algae, ferns, and bryophytes

9.3 Erasmus Darwin

Among the ardent admirers of Linnaeus was the brilliant physician-poet, Erasmus Darwin (1731-1802), who was considered by Coleridge to have "...a greater range of knowledge than any other man in Europe". He was also the best English physician of his time, and George III wished to have him as his personal doctor. However, Darwin preferred to live in the north of England rather than in London, and he refused the position.

In 1789, Erasmus Darwin published a book called *The Botanic Garden or The Loves of the Plants*. It was a book of botany written in verse, and in the preface Darwin stated that his purpose was "...to inlist imagination under the banner of science.." and to call the reader's attention to "the immortal works of the celebrated Swedish naturalist, Linnaeus". This book was immensely popular at the time when it was written, but it was later satirized by Pitt's Foreign Minister, Canning, whose book *The Loves of the Triangles* ridiculed Darwin's poetic style.

In 1796 Erasmus Darwin published another book, entitled *Zoonomia*, in which he proposed a theory of evolution similar to that which his grandson, Charles Darwin, was later to make famous. "...When we think over the great changes introduced into various animals", Darwin wrote, "as in horses, which we have exercised for different purposes of strength and swiftness, carrying burthens or in running races; or in dogs, which have been cultivated for strength and courage, as the bull-dog; or for acuteness of his sense of smell, as in the hound and spaniel; or for the swiftness of his feet, as the greyhound; or for his swimming in the water, or for drawing snow-sledges, as the rough-haired dogs of the north... and add to these the great change of shape and color which we daily see produced in smaller animals from our domestication of them, as rabbits or pigeons;... when we revolve in our minds the great similarity of structure which obtains in all the warm-blooded animals, as well as quadrupeds, birds and amphibious animals, as in mankind, from the mouse and the bat to the elephant and whale; we are led to conclude that they have alike been produced from a similar living filament."

"Would it be too bold", Erasmus Darwin asked, "to imagine that in the great length of time since the earth began to exist, perhaps millions of ages before the commencement of the history of mankind - would it be to bold to imagine that all warm-blooded animals have arisen from one living filament?"

Chapter 10

GOETHE AND SCHILLER

10.1 Johann Wolfgang von Goethe

Johann Wolfgang von Goethe (born in 1749) achieved international fame at the age of 25 with his novel, *The sorrows of young Werther*.

In 1775, after studying law, Goethe was invited the court of Karl August, the Duke of Saxe-Weimar-Eisenach. At that time, the Duke was 18 years old, and Goethe was 26. Goethe remained in Weimar for the rest of his life.

Goethe soon became an indispensable aid to the young Duke, and his chief advisor. Wikipedia states that

"During his first ten years in Weimar, Goethe became a member of the Duke's privy council, sat on the war and highway commissions, oversaw the reopening of silver mines in nearby Ilmenau, and implemented a series of administrative reforms at the University of Jena. He also contributed to the planning of Weimar's botanical park and the rebuilding of its Ducal Palace,,,

"Goethe, aside from official duties, was also a friend and confidant to the Duke, and participated in the activities of the court. For Goethe, his first ten years at Weimar could well be described as a garnering of a degree and range of experience which perhaps could be achieved in no other way. In 1779, Goethe took on the War Commission of the Grand Duchy of Saxe-Weimar, in addition to the Mines and Highways commissions. In 1782, when the chancellor of the Duchy's Exchequer left his office, Goethe agreed to act in his place for two and a half years; this post virtually made him prime minister and the principal representative of the Duchy. Goethe was ennobled in 1782 (this being indicated by the 'von' in his name)".

Scientific work

Goethe was greatly interested in that natural sciences, and his writings include works on the theory of colors, and on biological topics such as metamorphosis and homologies. He

discovered a bone, present in many mammals, including humans, now called "Goethe's bone". Goethe was also interested in geology, and he had the largest collection of minerals in Europe. By the time of his death, he had collected 17,800 rock samples.

Travels in Italy

During the years 1786-1788, Goethe traveled in Italy and Sicily. Regarding Sicily, he wrote, "To have seen Italy without having seen Sicily is to not have seen Italy at all, for Sicily is the clue to everything." Here he discovered Greek architecture's simplicity compared with Roman architecture, and he became enthusiastic about the Greek style.

Goethe later published an account of his travels in Italy as a nonfiction book. However, the book has nothing to say about the last year of his travels, and little is known about this last year except that he spent most of it in Venice.

Faust

Towards the end of his life, Goethe published Part One of his verse-drama *Faust*. Part Two was published after his death. Today *Faust* is regarded as one of the greatest works of German literature.

Figure 10.1: **Goethe in 1775.**

Figure 10.2: **Goethe, age 38, painted by Angelica Kauffman 1787.**

Figure 10.3: **Ulrike von Levetzow.**

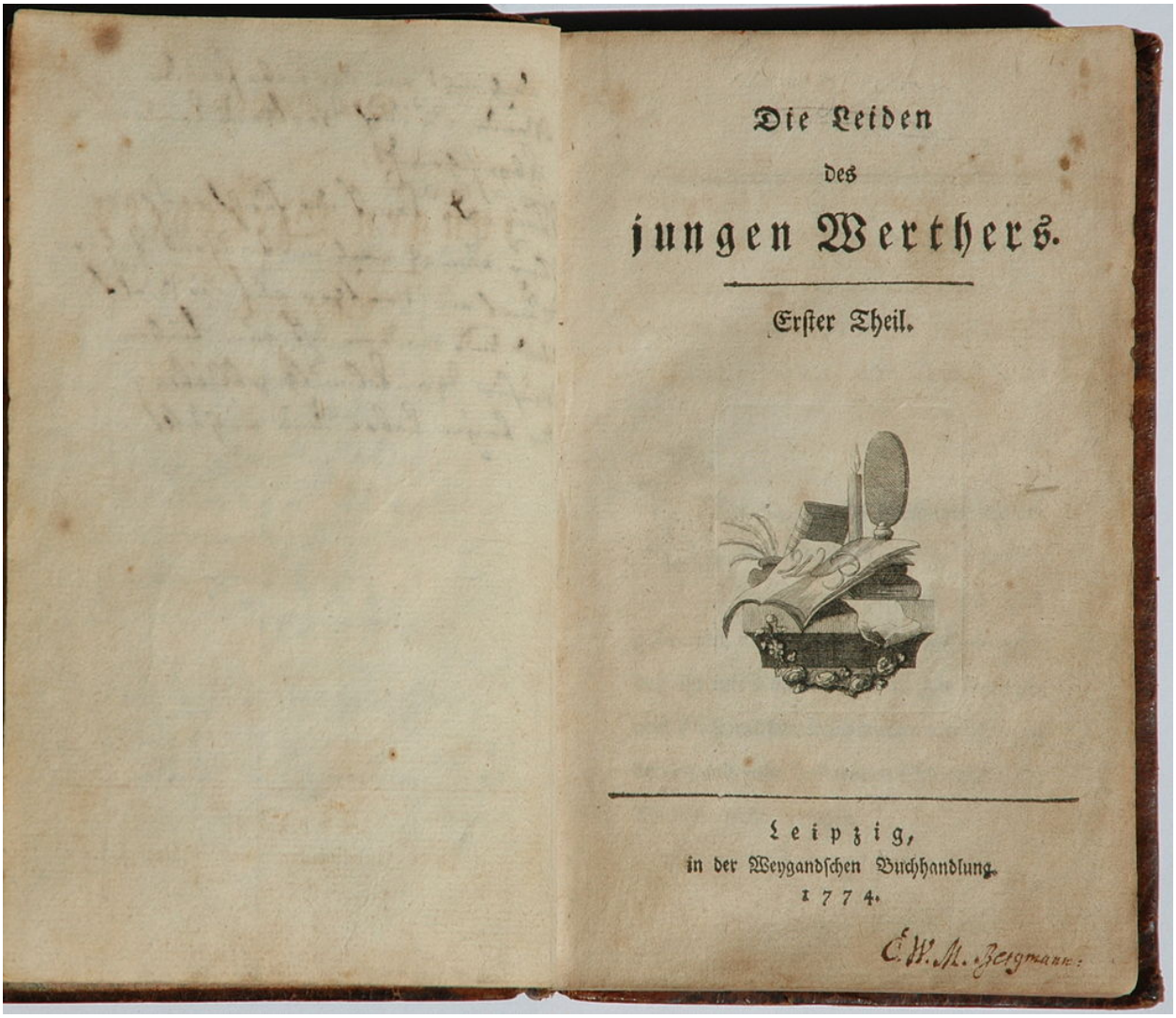


Figure 10.4: **First edition of *The Sorrows of Young Werther*.**

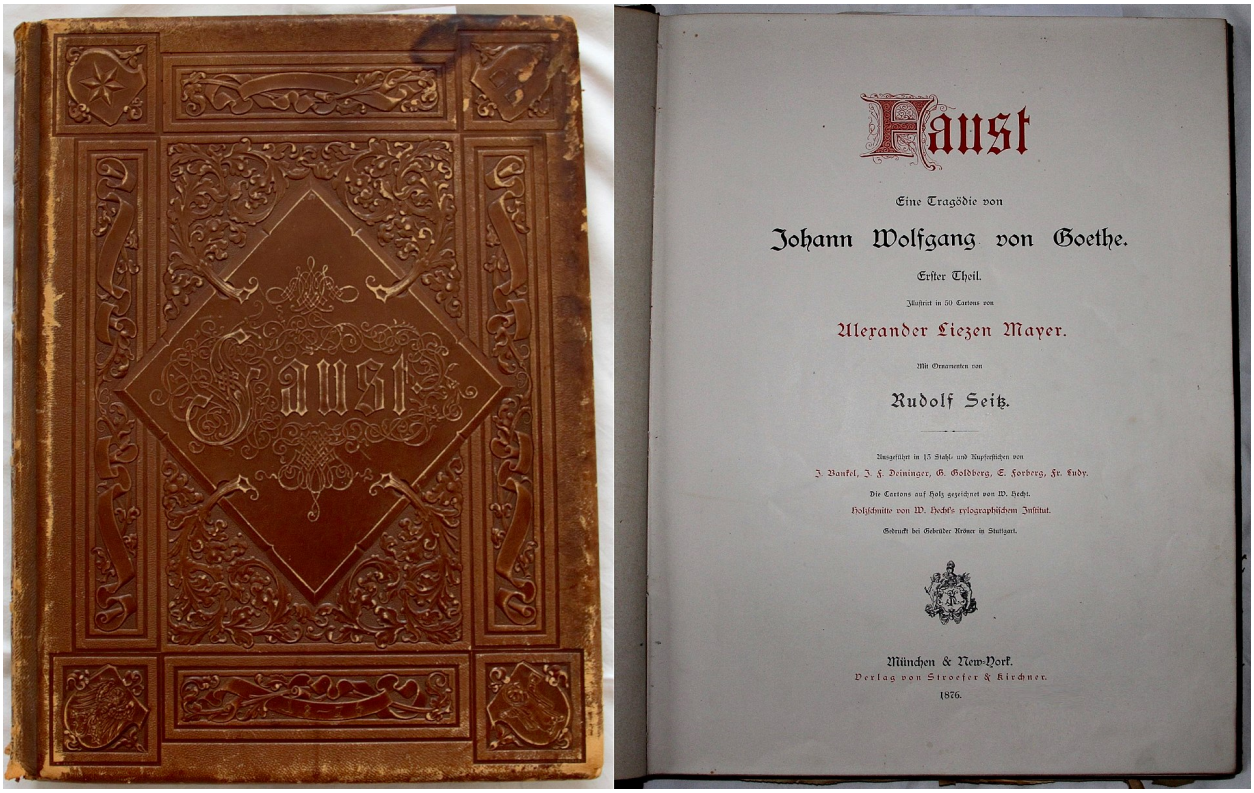


Figure 10.5: ***Faust*, by Goethe, decorated by Rudolf Seitz.**

Figure 10.6: **Goethe-Schiller Monument, Weimar.**

Figure 10.7: **Goethe in the Roman Campagna (1786) by Tischbein.**

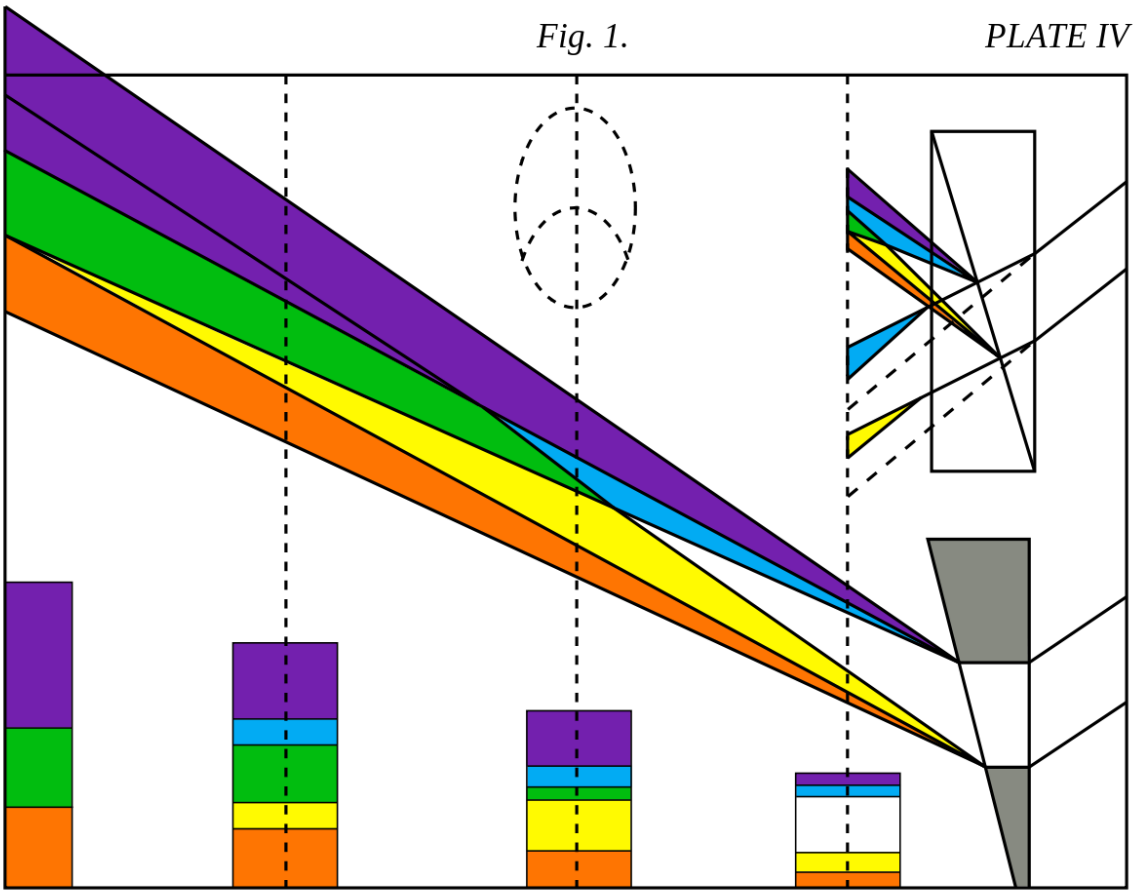


Figure 10.8: **Light spectrum, from *Theory of Colors*. Goethe observed that with a prism, color arises at light-dark edges, and the spectrum occurs where these colored edges overlap.**

Figure 10.9: **Schiller, Alexander and Wilhelm von Humboldt, and Goethe in Jena, 1797.**

10.2 Friedrich Schiller

Schiller's early life and education

Friedrich Schiller was born on 10 November 1759, in Marbach, Württemberg, Germany. He was the only son of a military doctor, who was often away from home during the Seven Years War. Friedrich Schiller's early education was not good, but he was taught Latin and Greek by the local priest.

In 1766, Schiller's father took up a post in the service of the Duke of Würtenberg. The Duke noticed signs of promise in Friedrich Schiller, and he placed the boy in an elite military academy which had been founded by himself. As a result of this improved education, Schiller later studied medicine.

Die Räuber

While still a student, Schiller wrote the play *Die Räuber*. The play dramatizes the conflict between two brothers from the nobility. Their elder brother leads a group of rebellious students to form a Robin Hood-like bans in the Bohemian forest, robing the rich, and giving to the poor. Meanwhile, th younger brother busies himself in trying to take control of the large family fortune.

When performed. *Die Räuber* caused a sensation because of its forcefully written liberal and even revolutionary ideas. The play made Schiller instantly famous.

Ode to Joy

In our own time, Schiller's lasting fame is due to his poem, *An die Freude* (Ode to Joy) (1785) which became the basis for the last movement of Beethoven's ninth symphony. Beethoven's immortal music and Schiller's words combine to give us an anthem for all of humanity. All men and women are brothers and sisters, not just some, **All!**

Schiller's literary work

Plays

- Die Räuber (The Robbers), 1781
- Fiesco (Die Verschwörung des Fiesco zu Genua), 1783
- Kabale und Liebe (Intrigue and Love), 1784
- Don Karlos, Infant von Spanien (Don Carlos), 1787
- Wallenstein, 1800
- Maria Stuart (Mary Stuart), 1800
- Die Jungfrau von Orleans (The Maid of Orleans), 1801
- Turandot, Prinzessin von China, 1801
- Die Braut von Messina (The Bride of Messina), 1803
- Wilhelm Tell (William Tell), 1804

- Demetrius (unfinished at his death)

Histories

- Geschichte des Abfalls der vereinigten Niederlande von der spanischen Regierung or The Revolt of the Netherlands
- Geschichte des dreissigjährigen Kriegs or A History of the Thirty Years' War
- Über Völkerwanderung, Kreuzzüge und Mittelalter or On the Barbarian Invasions, Crusaders and Middle Ages

Translations

- Euripides, Iphigenia in Aulis
- William Shakespeare, Macbeth
- Jean Racine, Phèdre
- Carlo Gozzi, Turandot, 1801

Prose

- Der Geisterseher or The Ghost-Seer (unfinished novel) (started in 1786 and published periodically. Published as book in 1789)
- Über die ästhetische Erziehung des Menschen in einer Reihe von Briefen (On the Aesthetic Education of Man in a Series of Letters), 1794
- Der Verbrecher aus verlorener Ehre (Dishonoured Irreclaimable), 1786

Poems

- An die Freude (Ode to Joy) (1785) became the basis for the fourth movement of Beethoven's ninth symphony
- Der Taucher (The Diver; set to music by Schubert)
- Die Kraniche des Ibykus (The Cranes of Ibykus)
- Der Ring des Polykrates (Polycrates' Ring)
- Die Bürgschaft (The Hostage; set to music by Schubert)
- Das Lied von der Glocke (Song of the Bell)
- Das verschleierte Bild zu Sais (The Veiled Statue at Sais)
- Der Handschuh (The Glove)
- Nänie (set to music by Brahms)

Figure 10.10: **Portrait of Schiller by Ludovike Simanowiz (1794).**

Figure 10.11: **Portrait of Friedrich Schiller by Gerhard von Kügelgen.**

Figure 10.12: **French-occupied German stamp depicting Schiller.**

Suggestions for further reading

1. *The Life of Goethe* by George Henry Lewes
2. *Goethe: The History of a Man* by Emil Ludwig
3. *Goethe by Georg Brandes. Authorized translation from the Danish (2nd ed. 1916)* by Allen W. Porterfield, New York, Crown publishers, 1936.
4. *Goethe: his life and times* by Richard Friedenthal
5. *Lotte in Weimar: The Beloved Returns* by Thomas Mann
6. *Conversations with Goethe* by Johann Peter Eckermann
7. *Goethe's World: as seen in letters and memoirs* ed. by Berthold Biermann
8. *Goethe: Four Studies* by Albert Schweitzer
9. *Goethe Poet and Thinker* by E.M. Wilkinson and L.A. Willoughby
10. *Goethe and his Publishers* by Siegfried Unseld [de]
11. *Goethe* by T.J. Reed
12. *Goethe. A Psychoanalytic Study*, by Kurt R. Eissler
13. *The Life of Goethe.* A Critical Biography by John Williams
14. *Goethe: The Poet and the Age (2 Vols.)*, by Nicholas Boyle
15. *Goethe's Concept of the Daemonic: After the Ancients*, by Angus Nicholls
16. *Goethe and Rousseau: Resonances of their Mind*, by Carl Hammer, Jr.
17. *Doctor Faustus of the popular legend, Marlowe, the Puppet-Play, Goethe, and Lenau, treated historically and critically. - A parallel between Goethe and Schiller. - An historic outline of German Literature* , by Louis Pagel
18. *Goethe and Schiller, Essays on German Literature*, by Hjalmar Hjorth Boyesen
19. *Goethe-Wörterbuch (Goethe Dictionary, abbreviated GWb).* Herausgegeben von der Berlin-Brandenburgischen Akademie der Wissenschaften, der Akademie der Wissenschaften in Göttingen und der Heidelberger Akademie der Wissenschaften. Stuttgart. Kohlhammer Verlag;
20. *West-Eastern Divan: Complete, annotated new translation, including Goethe's 'Notes and Essays' & the unpublished poems*, translated by Eric Ormsby, 2019. Gingko,

Chapter 11

PIONEERS OF CHEMISTRY

11.1 Lavoisier: "the father of modern chemistry"

Antoine-Laurent de Lavoisier (1743-1794) was born into a French noble family. At the age of five, after the death of his mother, he inherited a large fortune. When he was eleven years old, Lavoisier became a student at the Collège des Quatre-Nations, University of Paris, where he studied chemistry, botany, astronomy, and mathematics. He later obtained a degree in law, and was admitted to the bar, but he never practiced as a lawyer. Instead he returned to his earlier scientific interests, studying geology and participating in a geological survey of Alsace-Lorraine. In 1764, at the age of 21, he read his first paper to the French Academy of Sciences. It was on the chemical and physical properties of gypsum.

Lavoisier greatly admired the ideals of the Enlightenment, and he believed that scientific progress should be used for the betterment of the whole population, including all classes. His concern for the general welfare can be seen in his essay on the problem of urban street lighting, for which he received a gold medal from the king in 1766. He later designed an aqueduct to bring clean water to Paris from the river Yvette. When his plans were not carried out, he turned his attention to methods for purifying water from the Seine. and other problems of public hygiene and sanitation. Lavoisier also worked to improve the ventilation of hospitals and the living conditions of prisons. His other projects for public welfare included agricultural improvements. He founded the educational organizations Lycée Muse des Arts et Métiers, and he opened an expensive and sophisticated laboratory where young scientists were free to work.

Lavoisier spent large amounts of his own money on these projects, and the fortune that he had inherited from his mother would not have been sufficient. He had another source of income, however: He had invested massively in the Ferme générale, a tax-gathering company. This investment would later lead to his death under Robespierre's Reign of Terror.

It should be mentioned that Lavoisier was a gifted administrator, and he was much in demand for the leadership of various governmental commissions. Perhaps his contributions to chemistry would have been still greater than they were, had it not been for these

administrative duties.

Lavoisier's contributions to chemistry

Lavoisier's work was a turning point in the history of chemistry. He made the subject quantitative through his insistence on precise weighing of reactants and products and his methods for carrying out reactions within sealed flasks to prevent contamination from external sources. He also carefully measured the heat produced by chemical reactions.

Lavoisier's careful experiments with combustion put an end to the outdated and counter-intuitive "plogiston" theory - counter-intuitive because to explain experimental observations, the substance "plogiston" would need to have a negative mass. Lavoisier's studies of the role of oxygen in combustion put an end to this nonsense. His experiments also demonstrated that the respiration of an animal can be thought of as a slow form of combustion. Lavoisier also made very important contributions to chemistry by defining an element as a substance which cannot be further decomposed, and by introducing convenient conventions for chemical notation.

According to the New World Encyclopedia's article on Lavoisier, "Some of Lavoisier's most important experiments examined the nature of combustion, or burning. Through these experiments, he demonstrated that burning is a process that involves the combination of a substance with oxygen. He also demonstrated the role of oxygen in metal rusting, as well as its role in animal and plant respiration: working with Pierre-Simon Laplace, Lavoisier conducted experiments that showed that respiration was essentially a slow combustion of organic material using inhaled oxygen. Lavoisier's explanation of combustion replaced the phlogiston theory, which presumed that materials release a substance called phlogiston when they burn, a theory that was prominently held by Joseph Priestley during the latter part of the eighteenth century. Lavoisier studied Priestley's works and discussed the phenomenon of combustion with the English clergyman scientist who visited him in France. Due to Lavoisier's exacting measurements of the products of combustion, he was led to the conclusion that there was an element in the air which must combine with the materials being burned. He was able to determine the exact proportions of the element oxygen in the air by weighing and measuring the solids and gasses involved both before and after the experiments.

"Lavoisier's experiments were among the first truly quantitative chemical experiments ever performed; that is, he carefully weighed the reactants and products involved, a crucial step in the advancement of chemistry. He showed that, although matter can change its state in a chemical reaction, the quantity of matter is the same at the end as at the beginning of every chemical reaction. He burned phosphorus and sulfur in air, and proved that the products weighed more than the original. Nevertheless, the weight gained was lost from the air.

"These experiments provided evidence for the law of the conservation of matter, which was later formulated as the law of conservation of mass. It was only after the realization that matter can be neither created nor destroyed within a physical system that chemistry became an exact science."

Figure 11.1: **Antoine Lavoisier and his wife, Marie-Anne Pierrette Paulze, by Jacques-Louis David, 1788.**

Figure 11.2: **Lavoisier explaining to his wife the results of an experiment on air, by Ernest Board.**

Figure 11.3: **A statue of Lavoisier in the Louvre.**

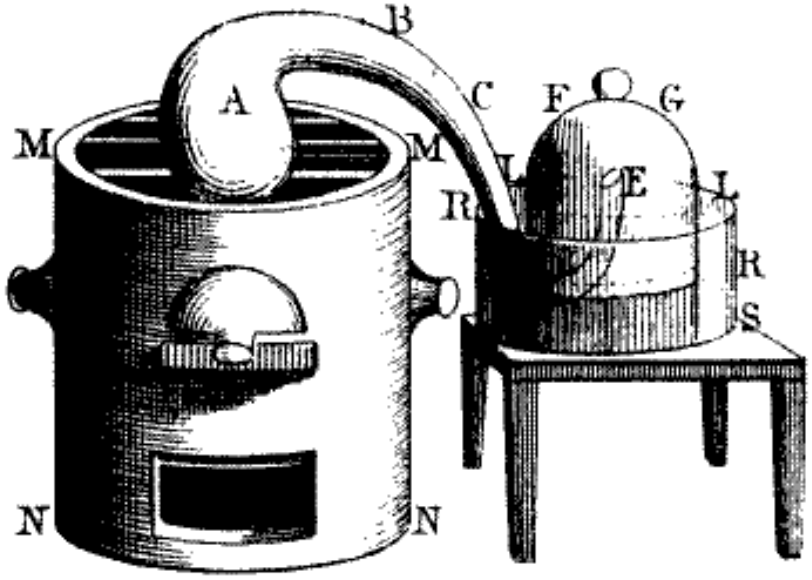


Figure 11.4: **Lavoisier's experiment on the decomposition of air, engraved by his wife.**

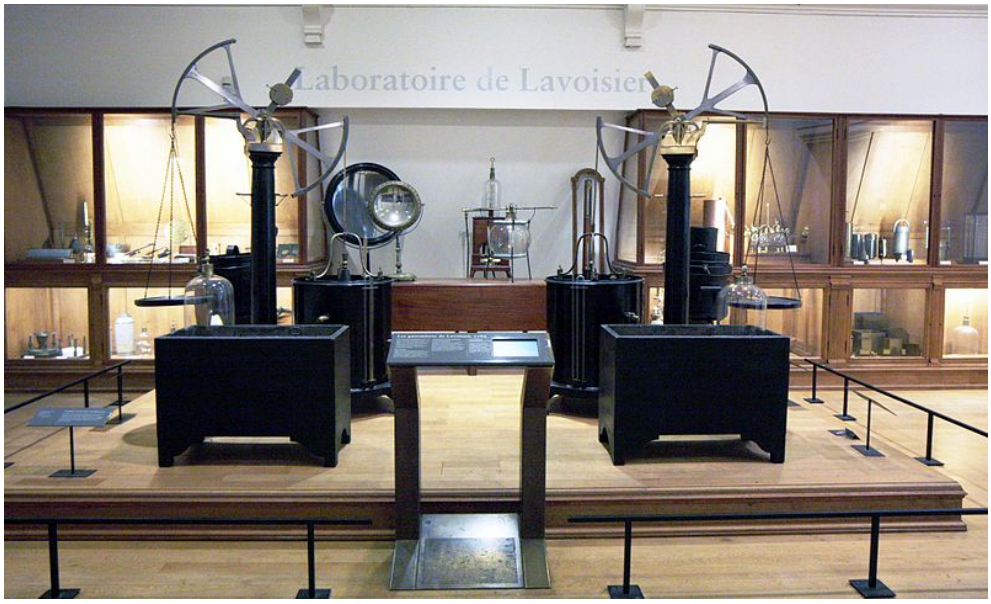


Figure 11.5: **Lavoisier's laboratory, exhibited at the Musée des Arts et Métiers, Paris.**

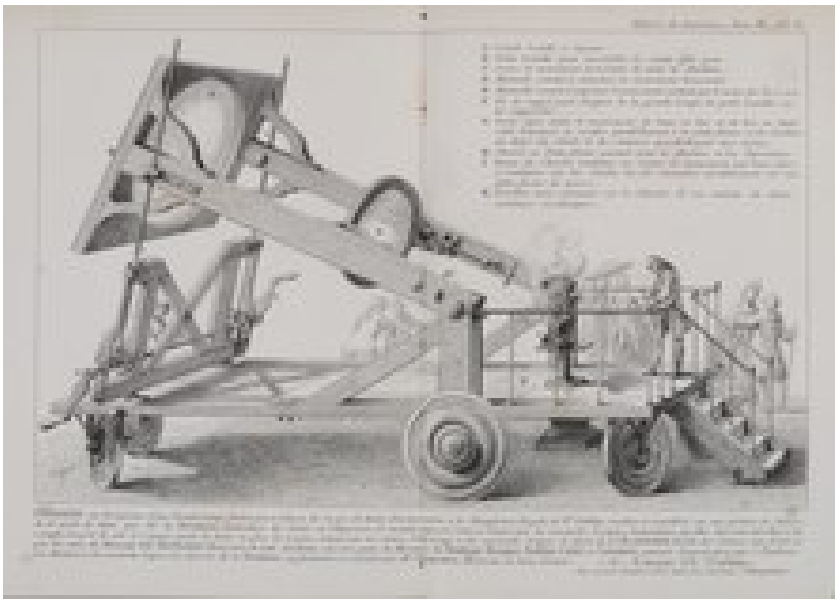


Figure 11.6: **Lavoisier's solar furnace.**

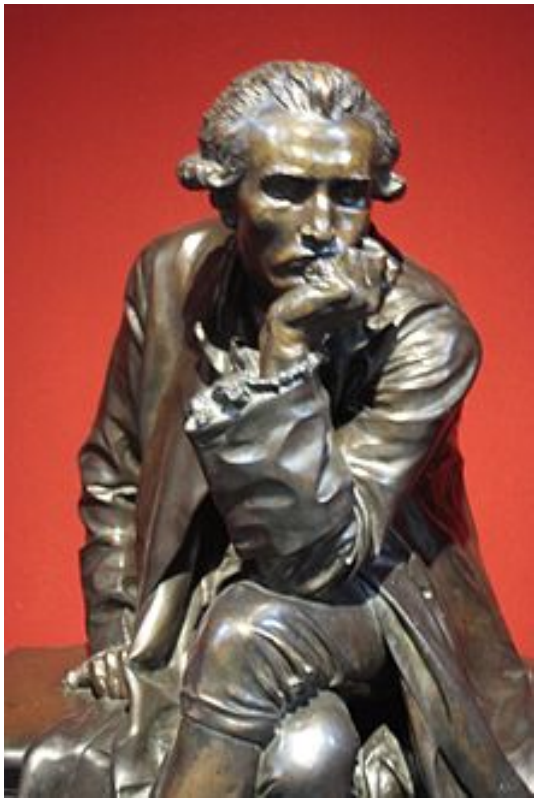


Figure 11.7: **A statue of Lavoisier by Jules Dalou, 1866.**

Some quotations from the English translation of Lavoisier's book on chemistry

Lavoisier's book, *Elements of Chemistry* is available from Project Gutenberg. Here are a few quotations which illustrate how advanced his thinking was, compared with previous authors. He rejected both the idea that earth, air, fire and water were elements and also phlogiston theory, and made chemistry a quantitative science.

The metals, except gold, and sometimes silver, are rarely found in the mineral kingdom in their metallic state, being usually less or more saturated with oxygen, or combined with sulphur, arsenic, sulphuric acid, muriatic acid, carbonic acid, or phosphoric acid. Metallurgy, or the docimastic art, teaches the means of separating them from these foreign matters; and for this purpose we refer to such chemical books as treat upon these operations.

We are probably only acquainted as yet with a part of the metallic substances existing in nature, as all those which have a stronger affinity to oxygen, than charcoal possesses, are incapable of being reduced to the metallic state, and, consequently, being only presented to our observation under the form of oxyds, are confounded with earths. It is extremely probable that barytes, which we have just now arranged with earths, is in this situation; for in many experiments it exhibits properties nearly approaching to those of metallic bodies. It is even possible that all the substances we call earths may be only metallic oxyds, irreducible by any hitherto known process.

Those metallic bodies we are at present acquainted with, and which we can reduce to the metallic or reguline state, are the following seventeen:

1. **Arsenic.**
2. **Molybdena.**
3. **Tungstein.**
4. **Manganese.**
5. **Nickel.**
6. **Cobalt.**
7. **Bismuth.**
8. **Antimony.**
9. **Zinc.**
10. **Iron.**
11. **Tin.**
12. **Lead.**
13. **Copper.**
14. **Mercury.**
15. **Silver.**
16. **Platina.**
17. **Gold.**

It is necessary to remark, that earths and alkalies unite with acids to form neutral salts without the intervention of any medium, whereas metallic substances are incapable of forming this combination without being previously less or more oxygenated; strictly speaking, therefore, metals are not soluble in acids, but only metallic oxyds. Hence, when we put a metal into an acid for solution, it is necessary, in the first place, that it become oxygenated, either by attracting oxygen from the acid or from the water; or, in other words, that a metal cannot be dissolved in an acid unless the oxygen, either of the acid, or of the water mixed with it, has a stronger affinity to the metal than to the hydrogen or the acidifiable base; or, what amounts to the same thing, that no metallic solution can take place without a previous decomposition of the water, or the acid in which it is made. The explanation of the principal phenomena of metallic solution depends entirely upon this simple observation, which was overlooked even by the illustrious Bergman.

The first and most striking of these is the effervescence, or, to speak less equivocally, the disengagement of gas which takes place during the solution; in the solutions made in nitric acid this effervescence is produced by the disengagement of nitrous gas; in solutions with sulphuric acid it is either sulphurous acid gas or hydrogen gas, according as the oxydation of the metal happens to be made at the expence of the sulphuric acid or of the water. As both nitric acid and water are composed of elements which, when separate, can only exist in the gasseous form, at least in the common temperature of the atmosphere, it is evident that, whenever either of these is deprived of its oxygen, the remaining element must instantly expand and assume the state of gas; the effervescence is occasioned by this sudden conversion from the liquid to the gasseous state. The same decomposition, and consequent formation of gas, takes place when solutions of metals are made in sulphuric acid: In general, especially by the humid way, metals do not attract all the oxygen it contains; they therefore reduce it, not into sulphur, but into sulphurous acid, and as this acid can only exist as gas in the usual temperature, it is disengaged, and occasions effervescence.

The second phenomenon is, that, when the metals have been previously oxydated, they all dissolve in acids without effervescence: This is easily explained; because, not having now any occasion for combining with oxygen, they neither decompose the acid nor the water by which, in the former case, the effervescence is occasioned.

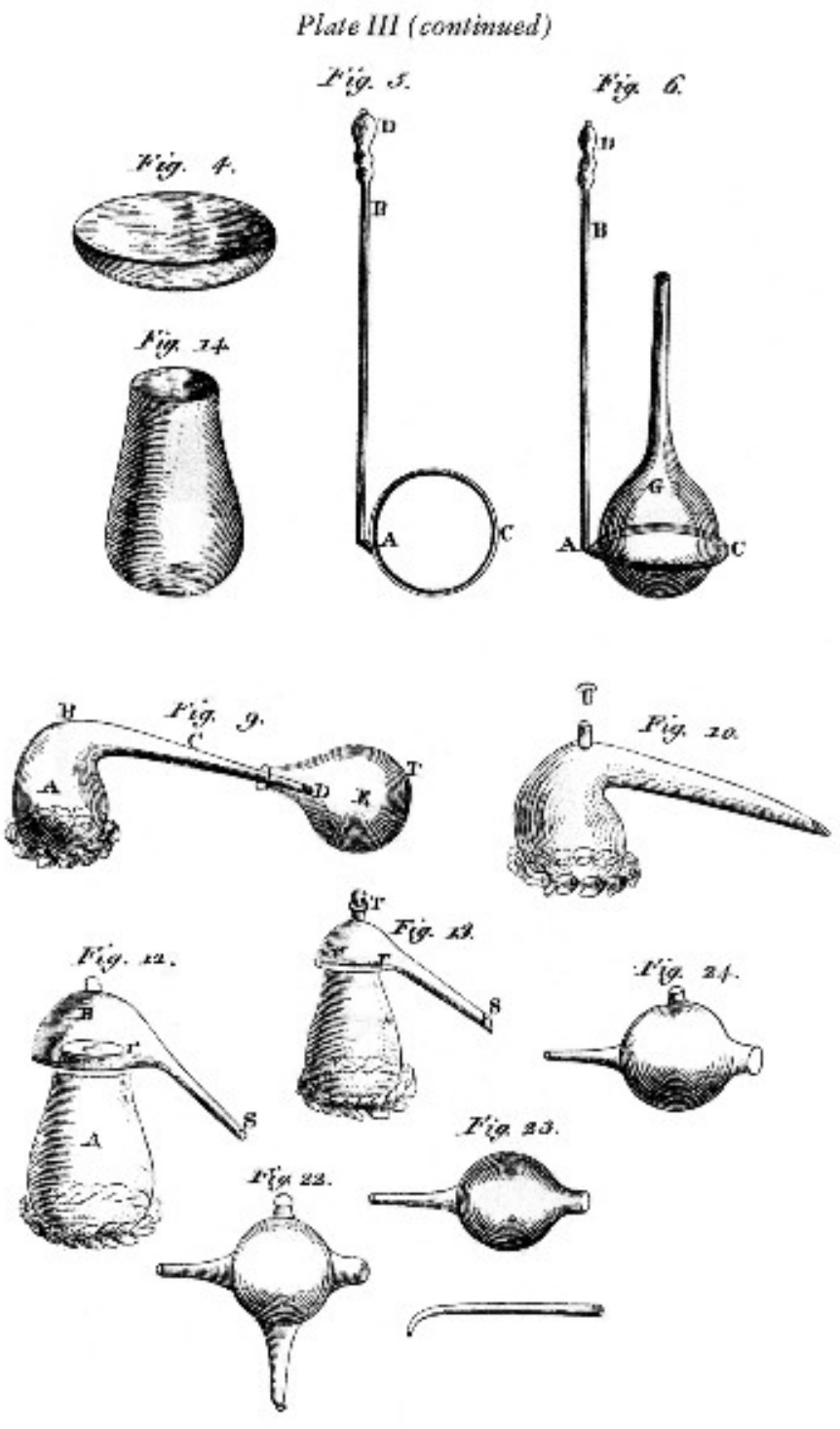


Figure 11.8: **Apparatus used by Lavoisier in his chemical experiments.**

Plate IV (continued)

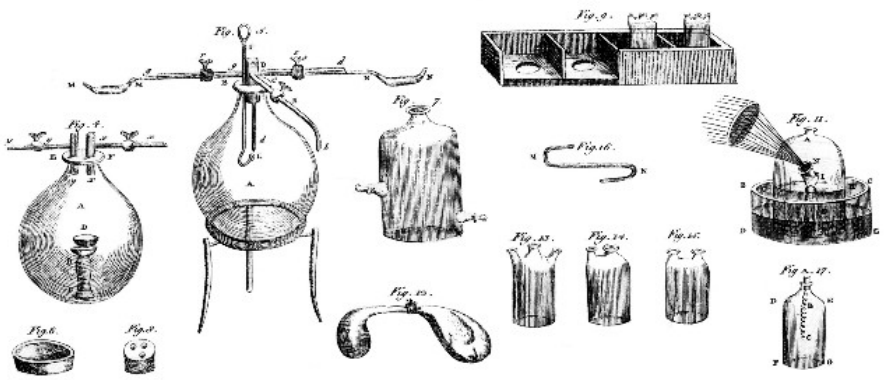
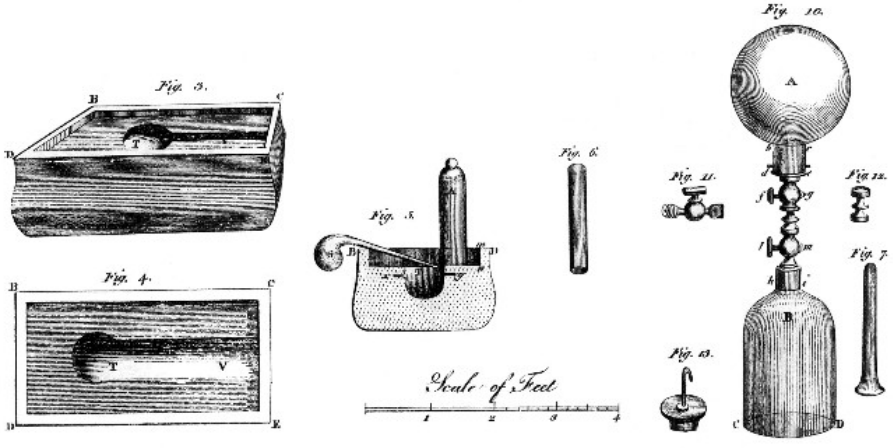


Plate V (continued)



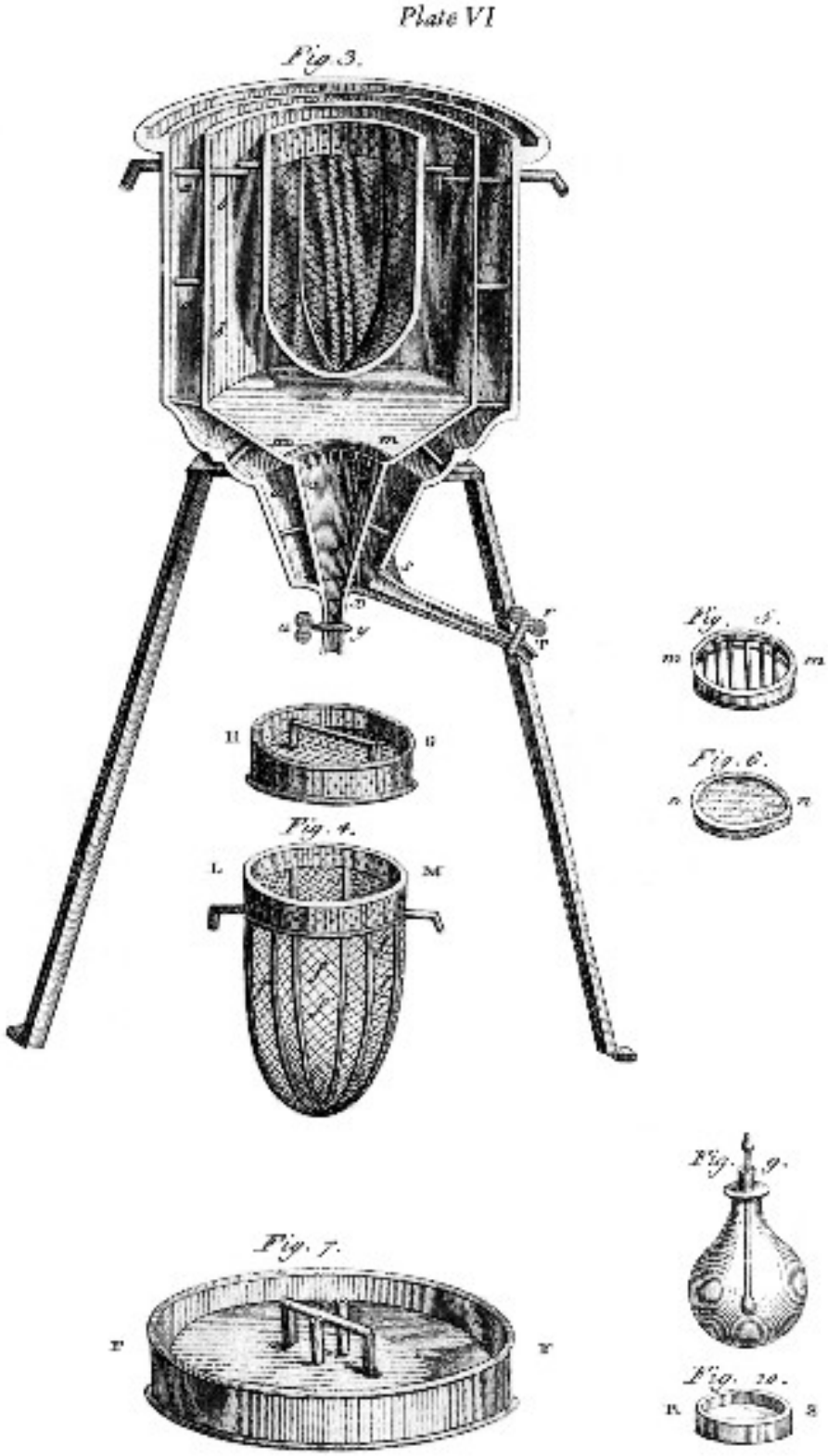


Plate VI
Fig. 3.
Fig. 5.
Fig. 6.
Fig. 4.
Fig. 7.
Fig. 9.
Fig. 10.

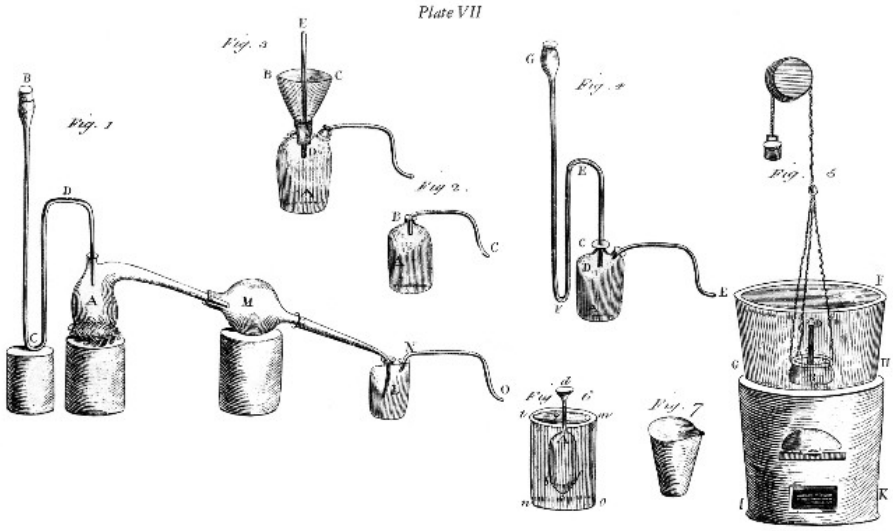


Plate VII
Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7

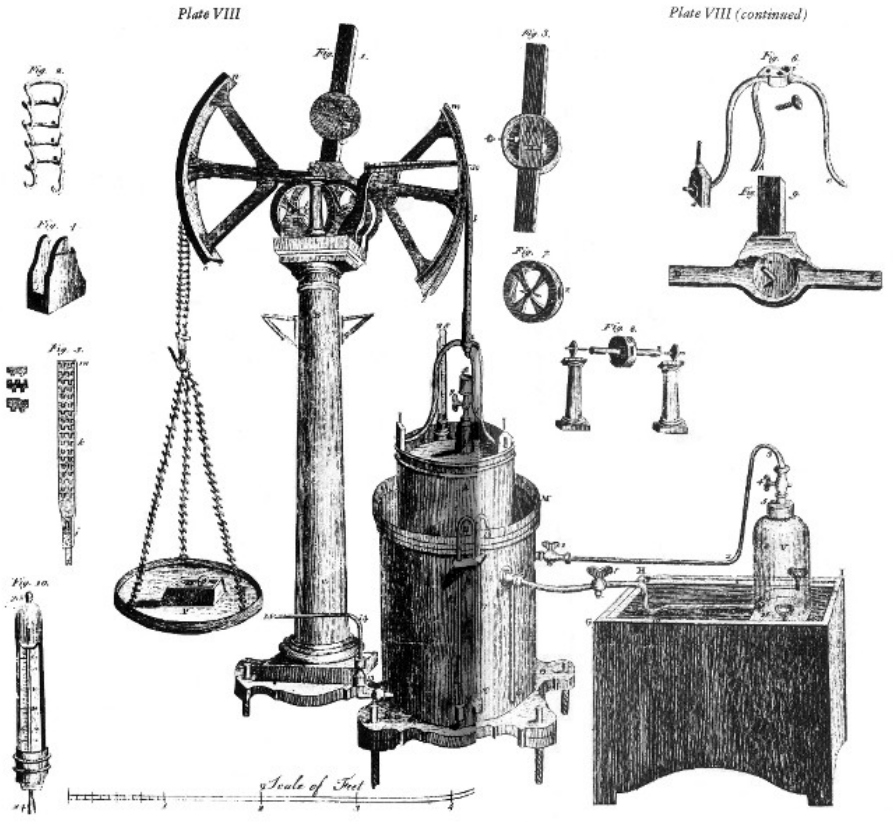


Plate VIII
Plate VIII (continued)
Scale of Feet

11.2 William Cullen

The two driving forces behind the Industrial Revolution were world trade and scientific discovery. During the 18th century, both these forces were especially strongly felt in Scotland and in the north-western part of England. The distilling industry in Scotland grew enormously because of world trade; and the resulting interest in what happens when liquids are vaporized and condensed produced one of the major scientific and technical developments of the Industrial Revolution.

The first step in this development was taken by William Cullen, a professor of medicine at the universities of Glasgow and Edinburgh. In a paper entitled *Of the Cold Produced by Evaporation* (1749), Cullen wrote that he had noticed that "...water and some other liquids, in evaporating, produce some degree of cold".

Cullen therefore began to make experiments in which he dipped a thermometer in and out of a liquid and observed the drop in temperature. He noticed that the effect was increased by "...moving the thermometer very nimbly to and fro in the air; or if, while the ball was wet with spirit of wine, it was blown upon with a pair of bellows". In this way, Cullen achieved a temperature 44 degrees below the freezing point of water. He next tried producing vacuums above various liquids with the help of an air pump:

"We set the vessel containing the ether", Cullen wrote, "In another a little larger, containing water. Upon exhausting the receiver and the vessel's remaining a few minutes *in vacuo*, we found the most part of the water frozen, and the vessel containing the ether surrounded with a thick crust of ice."

Cullen had, in fact invented the refrigerator, and he gave the first known public demonstration of the device. However, it found no commercial application at the time.

11.3 Joseph Black

One of Cullen's favorite students at Edinburgh was Joseph Black (1728-1799). He became Cullen's scientific assistant, and later, in 1756, he was elected to the Chair of Medicine at Glasgow University. Continuing Cullen's work on the cold produced by evaporating liquids, Black discovered and studied quantitatively the phenomenon of latent heats, e.g., the very large quantities of heat which are necessary to convert ice into water, or to convert water into steam.

Black was led to his discovery of latent heats not only by Cullen's work, but also by his own observations on Scottish weather. Writing of the discovery, one of Black's friends at Glasgow recorded that "...since a fine winter day of sunshine did not at once clear the hills of snow, nor a frosty night suddenly cover the ponds with ice, Dr. Black was already convinced that much heat was absorbed and fixed in the water which slowly trickled from the wreaths of snow; and on the other hand, that much heat emerged from it while it was slowly changing into ice. For, during a thaw, a thermometer will always sink when removed from the air into melting snow; and during a severe frost it will rise when plunged into freezing water. Therefore in the first case, the snow is receiving heat, and in the last, the

water is allowing it to emerge again."

Besides studying latent heats, Black also measured the specific heats of various substances, i.e. the amount of heat needed to raise their temperature by a given amount. These studies were important not only to the foundation of the science of thermodynamics, but also to James Watt's development of an improved steam engine, and hence to the Industrial revolution. Black was a close friend of James Watt, and supported his work, both with advice and financially.

Joseph Black also discovered and studied carbon dioxide, CO_2, which he called "fixed air". He found that this gas could be produced by treating limestone, $CaCO_3$, with acids, or by heating limestone. Black observed that this gas was heavier than air, and that it could not support animal life or combustion.

In 1766, Joseph Black succeeded his mentor, William Cullen, and became Professor of Medicine and Chemistry at the University of Edinburgh. His teaching duties then became so heavy that they put an end to his scientific research. However, he was a gifted teacher, and his lectures helped to spread the concept of accurate measurement in chemistry to a wide audience.

According to a contemporary observer, "He became one of the principal ornaments of the University; and his lectures were attended by an audience which continued increasing from year to year, for more than thirty years. It could not be otherwise. His personal appearance and manners were those of a gentleman, and peculiarly pleasing. His voice in lecturing was low, but fine; and his articulation so distinct, that he was perfectly well heard by an audience consisting of several hundreds. His discourse was so plain and perspicuous, his illustration by experiment so apposite, that his sentiments on any subject never could be mistaken even by the most illiterate; and his instructions were so clear of all hypothesis or conjecture, that the hearer rested on his conclusions with a confidence scarcely exceeded in matters of his own experience."

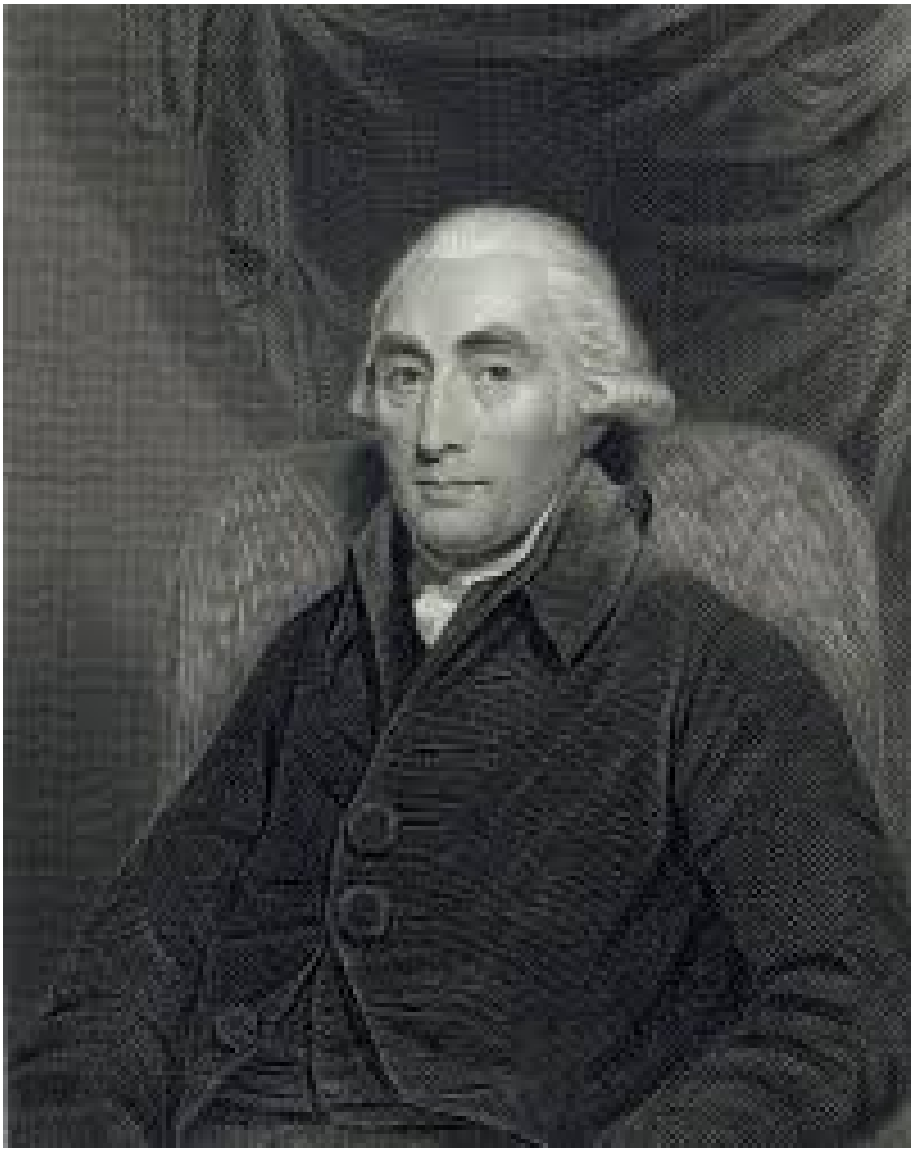


Figure 11.9: **Joseph Black (1728-1799).**

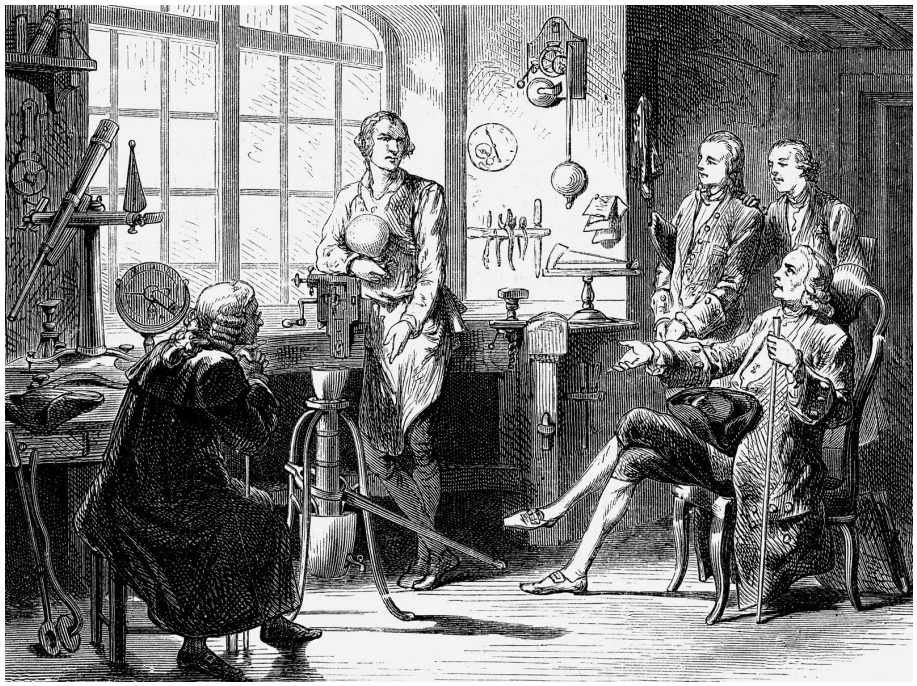


Figure 11.10: **Black with friends in his laboratory.**

Figure 11.11: **One of Joseph Black's important contributions to chemistry was his invention of a highly accurate analytical balance.**

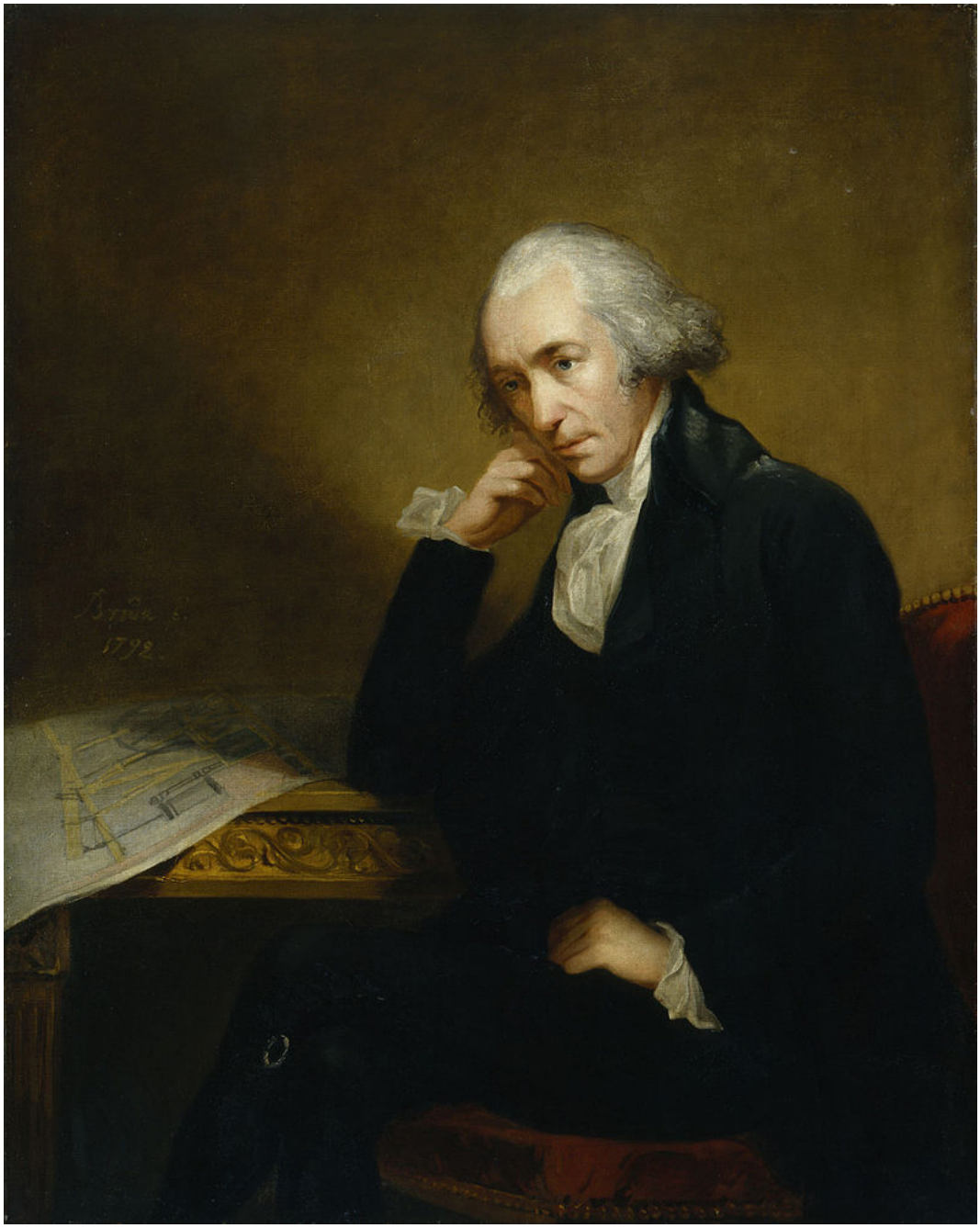


Figure 11.12: **James Watt (1736-1819). Joseph Black's work on latent heats and specific heats contributed greatly to Watt's invention of an efficient steam engine, and hence the Industrial Revolution. Black was a close friend of Watt, and helped him both with advice and financial support.**

11.4 Joseph Priestley

Joseph Priestley (1713-1804) was born in Yorkshire into a family of Dissenters. In those days, the Dissenters, who were Protestants outside the established Church of England, were discriminated against, and not allowed to hold public office or to vote.

After the early death of his mother, and his father's remarriage, Joseph Priestley went to live with a wealthy aunt and uncle. Recognizing the boy's highly precocious abilities his aunt and uncle gave him the best available education. He learned Greek, Latin, Hebrew, French, Italian, German, Aramaic and Arabic. His private tutor also introduced him to higher mathematics, natural philosophy, logic, and metaphysics.

In 1861, Joseph Priestley was given the post of tutor of modern languages and rhetoric at the Dissenting college, Warrington Academy. He soon made many friends there, including the famous potter, Josiah Wedgwood, with whom he corresponded for the remainder of his life.

A year later, Priestley married Mary Wilkinson, the sister of the industrialist John Wilkinson. Priestley wrote of her: "This proved a very suitable and happy connexion, my wife being a woman of an excellent understanding, much improved by reading, of great fortitude and strength of mind, and of a temper in the highest degree affectionate and generous; feeling strongly for others, and little for herself. Also, greatly excelling in every thing relating to household affairs, she entirely relieved me of all concern of that kind, which allowed me to give all my time to the prosecution of my studies, and the other duties of my station."

While at Warrington Academy, Priestley wrote many books. His *History of Electricity* became an influential standard text and it established his scientific reputation. On the basis of this book, he became a Fellow of the Royal Society.

The chemistry of gases

Priestley's studies of the chemistry of gases were described as follows in an article by David A. Bassett[1]: "As Priestley expanded his studies in chemistry he became active in the field of pneumatic chemistry, the study of air and gases. Priestley was the first to isolate and characterize a number of gases, including oxygen, nitrogen, hydrogen chloride, ammonia, sulfur dioxide, carbon monoxide, nitric oxide , and nitrous oxide. Priestley's names for these compounds were different from the modern names, in part because he never adopted the oxygen theory of chemistry. The names he used were in terms of the older 'phlogiston theory.' Priestley did this work using very simple apparatuses, such as saucers, glasses, tubes, cylinders, and tubs of water or mercury."

Priestley noticed that the gas which we now call oxygen could support the breathing of a mouse for a very long time, and that it was unusually effective in supporting combustion. On a visit to Paris, he communicated these results to Antoine Lavoisier, who repeated and extended Priestley's experiments.

[1] http://www.chemistryexplained.com/Pl-Pr/Priestley-Joseph.html

Figure 11.13: **Joseph Priestley (1733-1804) published 150 works on many subjects. As a theologian and philosopher, he contributed importantly to the founding of both the Unitarian and the Utilitarian movements. As a scientist, he wrote an influential *History of Electricity*, which describeded many of his own original experiments and an anticipation of Coulomb's Law. As a chemist, he isolated several gases, including oxygen. He also invented soda water and thus is the "father of the soft drinks industry".**

Figure 11.14: **Mary Priestley, in a portrait by Carl F. von Breda (1793). She was the daughter of ironmaster Isaac Wilkinson, and sister of industrialist John Wilkinson**

Figure 11.15: **The Birmingham mob burning Joseph Priestley's home.**

The Priestley Riots of 1791

On the 14th of July, 1791, Joseph Priestley's home in Birmingham was burned by a mob, which targeted Dissenters and those who supported the results of the French Revolution. The mob, which was tacitly condoned by Pitt's government, destroyed four Dissenting chapels, twenty-seven homes, and a number of businesses. Joseph Priestley fled with his family, first to London, and afterwards to the United States. He spent the last ten years of his life in Pennsylvania.

11.5 Henry Cavendish

Henry Cavendish (1731-1810) was born into the English nobility. His father, Lord John Cavendish, was the second son of the Duke of Devonshire, while his mother, Lady Anne de Grey, was the daughter of the Duke of Kent. Lady Anne died in 1733, and Henry Cavendish was brought up by his father, Lord John, whose interests were divided between politics and science. Henry Cavendish followed his father into scientific research, but, being shy to the point of eccentricity, not into politics. He attended Cambridge University for three years, but left without obtaining a degree, which was a common practice at the time.

Father and son at the Royal Society

Starting in 1758, Lord John Cavendish began taking his son Henry to meetings of the Royal Society, of which he was a Fellow, and in 1760 Henry Cavendish also was elected to

be a Fellow of the Royal Society. Throughout his life, the younger Cavendish attended as many meetings as possible, and this was almost his only social activity.

Contributions to chemistry

Like Black and Priestley, Henry Cavendish contributed importantly to the study of gas chemistry. Cavendish showed that the air exhaled by mammals when breathing is "fixed air", i.e. carbon dioxide. He also isolated and studied hydrogen, which he called "inflammable air". He produced hydrogen by reacting acids with metals, and correctly identified it as an element. He also correctly believed that when hydrogen is burned, two atoms of the element enter each molecule of water. He also measured the specific gravity and solubility in water of these gases. His results, reported in his 1778 paper *General Considerations on Acids*, won him the Copley Medal of the Royal Society.

In 1785, Cavendish made a series of very accurate studies of the composition of ordinary air. He concluded that ordinary air is a mixture of four parts of the gas that we now call nitrogen with one part of oxygen (again in modern terms). He also found a residue occupying 1/120-th the volume of the other two gases. About 100 years later, this small quantity of inert gas was identified as the element argon.

Cavendish also anticipated Dalton's law of partial pressures, which states that the total pressure exerted by a mixture of gases is the sum of the pressures that each individual gas would exert if it occupied the total volume by itself. However, this was among his many unpublished results.

Henry Cavendish was among the first outside France to embrace Lavoisier anti-phlogiston theories, However, Cavendish disagreed with Lavoisier about the nature of heat. Following Newtonian mechanics, Cavendish developed a mathematical theory of heat as due to the motion of particles. His theory included the conservation of energy and the mechanical equivilant of heat.

Weighing the earth

Cavendish made many important contributions to physics. Among them was his famous experiment to determine the density and total weight of the earth. To make this measurement, he used a sensitive torsion balance to measure the gravitational attraction between two spheres of lead. Cavendish was able to determine the gravitational attraction between these two spheres from the period of oscillation of the torsion balance. He found the average density of the earth to be 5.48 times greater than the density of water. His result was within one percent of the currently accepted figure.

Although he contributed importantly to many branches of physics, most of his results were unpublished, and credit for his discoveries went to others. After his death, his papers were carefully edited and published by the great physicist James Clerk Maxwell. At Maxwell's insistence, the famous Cavendish Laboratory, built at Cambridge University with money donated by a relative of Henry Cavendish, was named after him.

Figure 11.16: **The Hon. Henry Cavendish (1731-1810).**

Figure 11.17: **A drawing of Henry Cavendish.**

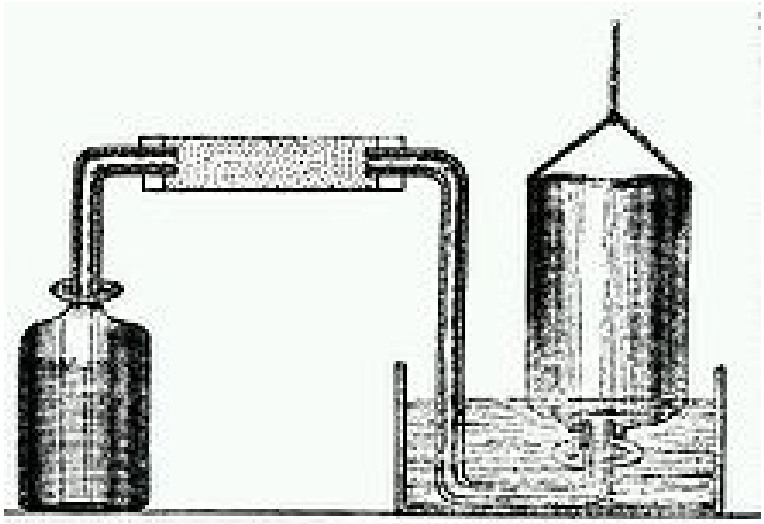


Figure 11.18: **The apparatus used by Henry Cavendish to produce and collect hydrogen.**

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Chapter 12

THE INDUSTRIAL REVOLUTION

During the Industrial Revolution, feudal society, with its patterns of village life and its traditional social obligations, was suddenly replaced by a money-dominated society whose rules were purely economic, and in which labor was regarded as a commodity. The changes produced by the industrial revolution at first resulted in social chaos - enormous wealth in some classes of society, and great suffering in other classes; but later, after the appropriate social and political adjustments had been made, the improved methods of production benefited all parts of society in a more even way.

12.1 Development of the steam engine

The discovery of atmospheric pressure

Early steam engines made use of the pressure of the atmosphere, and in fact it was the discovery of atmospheric pressure that led to the invention of the steam engine. Aristotle had maintained "nature abhors a vacuum", but this doctrine was questioned by the Italian physicist Evangelesta Torricelli (1608-1647), who invented the barometer in 1643.

Pump makers working for the Grand Duke of Tuscany had found that suction pumps were unable to raise water to heights greater than 10 meters (in today's units). Attempting to understand why this should be the case, Torricelli filled an approximately 1-meter-long glass tube with mercury, which is 14 times denser than water. The tube was sealed at one end, and open at the other. He then immersed the open end in a dish of mercury, and raised the sealed end, so that the tube was in a vertical position. Part of the mercury flowed out of the tube into the dish, leaving a 76-centimeter-high column of mercury, and 24 centimeters of empty space at the top. The empty space contained what we now call a Torricellian vacuum.

This experiment enabled Torricelli to understand why the Grand Duke's suction pumps were unable to raise water to a height greater than 10 meters. Torricelli realized that both the 10 meter column of water (the maximum that could be achieved), and the (equally heavy) 76 centimeter column of mercury, were held in place by the weight of the atmo-

sphere, which they exactly balanced. Later experiments soon demonstrated that the height of the column of mercury in Torricelli's barometer depended on the weather, and on height above sea level. Summarizing his experiments, Torricelli wrote: "We live submerged at the bottom of an ocean of elementary air, which is known by incontestable experiments to have weight."

Torricelli's experiments marked the start of period where, throughout Europe, much interest was focused on experiments with gases. In 1650 Otto von Guericke, the Mayor of Magdeburg Germany, invented the first vacuum pump. In a dramatic experiment, performed in 1663 in the presence of Frederick Wilhelm I of Brandenburg, von Guericke's assistants fitted two large copper hemispheres together, after the joining surfaces had been carefully greased to make the junction airtight. Von Guericke's pump was then used to evacuate the volume within the hemispheres. To the amazement of the watching crowd, a team of 24 horses, 12 on each side, strained at the hemispheres but failed to separate them. Von Guericke explained that it was the pressure of the atmosphere that held the hemispheres so tightly together, and he demonstrated that when air was allowed to enter the interior volume, the hemispheres could be separated without effort.

Steam engines using atmospheric pressure

Continuing the vogue for experiments with gases and pumps that was sweeping across Europe, Edward Somerset, the 2nd Marquess of Worcester, designed steam-powered pumps to bring water from wells to fountains. He published the designs for his engines in 1663, and he may have installed pumps built according to these designs at Vauxhall House in London. In the 1680's a number of steam-powered pumps were constructed for Louis XIV of France by Sir Samuel Morland (1625-1695), who lived in Vauxhall and may have been influenced by Somerset's ideas.

Meanwhile, in France, the physicist Denis Papin (1647-1712) had become interested in the motive force of steam. Together with Gottfried Leibniz he invented the pressure cooker, and he also invented designs for steam engines. Some of Papin's steam engine designs were presented to the Royal Society between 1707 and 1712, without acknowledgment or payment, and this caused Papin to complain bitterly. He died soon afterward.

In 1698, the English inventor Thomas Savery (1650-1715) patented a steam engine for pumping water. It had no piston, but used condensing steam and atmospheric pressure to bring up the water by means of a siphon principle. It was therefore useless for pumping water from very deep mines, although Savery described it as the "Miner's Friend". Savery's design was so similar to Somerset's that it was probably a direct copy.

The ironmonger Thomas Newcomen's "atmospheric-engine" of 1712 proved to be much more practical for pumping water from the deep mines of Cornwall. Newcomen was forced to go into a partnership with Savery because of the latter's patent, and he also used some of Papin's ideas. An important feature of Newcomen's engine was a beam that transmitted power from the working piston to a pump at the base of the mineshaft. In Newcomen's engine, steam entered the cylinder, driving the piston upward. A jet of water was then sprayed into the interior of the cylinder, condensing the steam and allowing atmospheric

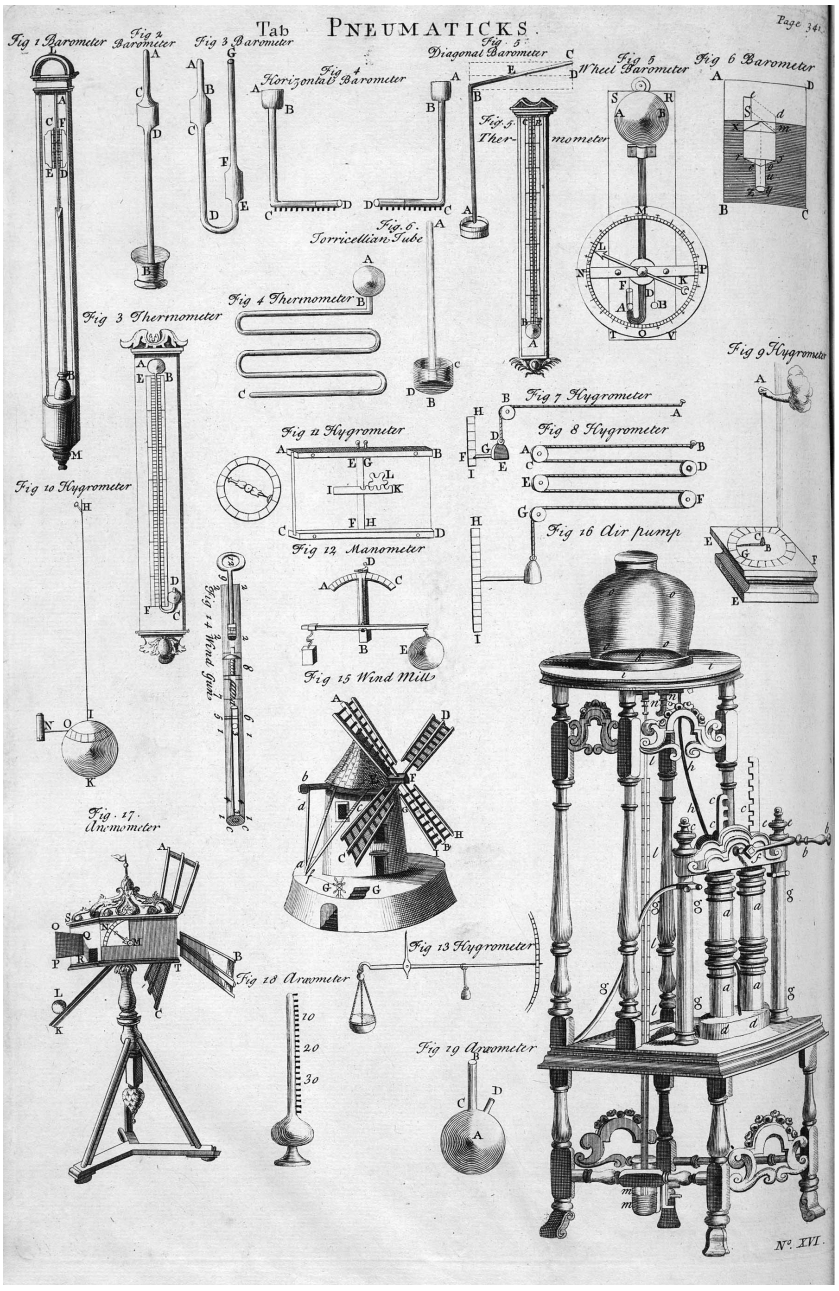

Figure 12.1: **"Table of Pneumaticks" (1728).**

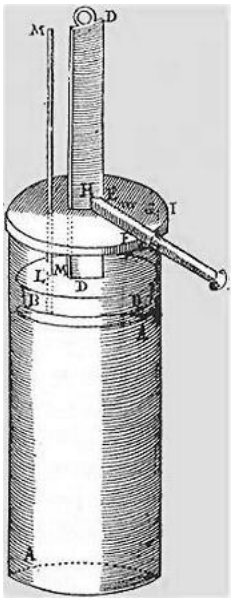

Figure 12.2: **The French physicist Papin's design for a steam engine (1690).**

pressure to drive the piston down. Early models of the engine operated slowly, and the valves were opened and closed by hand. Later, the opening and closing of the valves was performed automatically by means of the "potter cord". According to legend this device is named after a boy, Humphrey Potter, who in 1713 had been given the job of opening and closing the valves. Wishing to play with his friends, he invented the automatic mechanism.

The main problem with Newcomen's engine was that its fuel use was enormously wasteful. This was because, with every cycle, the cylinder was cooled by water, and then heated again by steam.

At Glasgow University, where Adam Smith was Professor of Moral Philosophy, there was a shop where scientific instruments were made and sold. The owner of the shop was a young man named James Watt (1736-1819), who came from a family of ship builders and teachers of mathematics and navigation. Besides being an extremely competent instrument maker, Watt was a self-taught scientist of great ability, and his shop became a meeting place for scientifically inclined students.

James Watt tried to repair the university's small-scale model of the Newcomen engine, but he failed to make it work well. He could see that it was extraordinarily inefficient in its use of fuel, and he began making experiments to find out why it was so wasteful. James Watt quickly found the answer: The engine was inefficient because of the large amounts of energy needed to heat the iron cylinder. In 1765, Watt designed an improved engine with a separate condenser. The working cylinder could then be kept continuously hot.

To have an idea for a new, energy-saving engine was one thing, however, and to make the machine practical was another. James Watt had experience as an instrument maker, but no experience in large-scale engineering. However, Watt formed a partnership with Matthew Boulton, who was the most talented and progressive manufacturer in England.

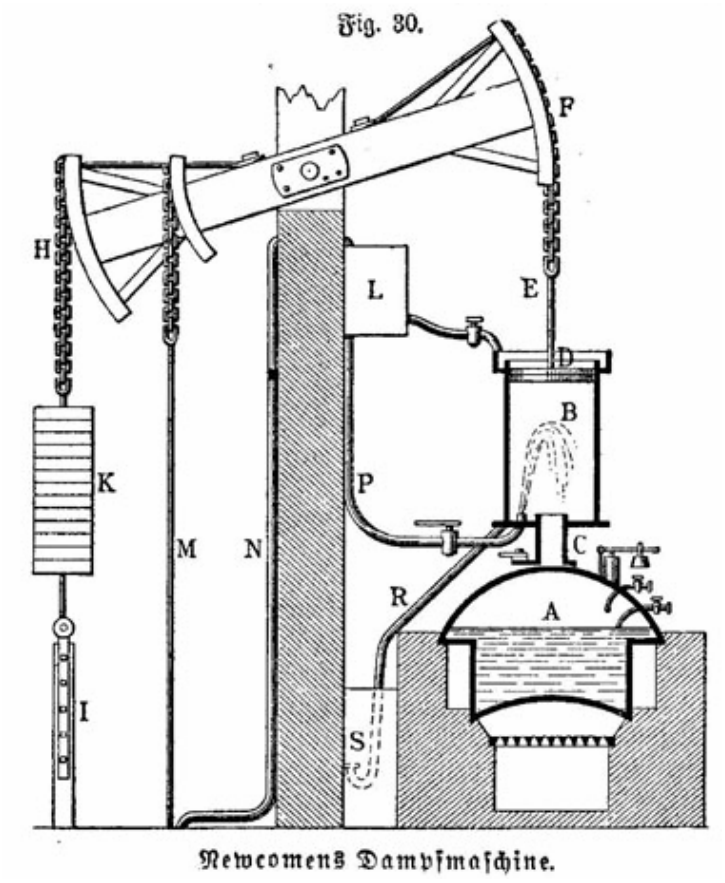

Figure 12.3: **Newcomen's steam engine.**

Boulton was more interested in applying art and science to manufacturing than he was in simply making money. His idea was to bring together under one roof the various parts of the manufacturing process which had been scattered among many small workshops by the introduction of division of labor. He believed that improved working conditions would result in an improved quality of products.

With these ideas in mind, Matthew Boulton built a large mansion-like house on his property at Soho, outside Birmingham, and installed in it all the machinery necessary for the complete production of a variety of small steel products. Because of his personal charm, and because of the comfortable working conditions at the Soho Manufactory, Boulton was able to attract the best and most skillful craftsmen in the region; and by 1765, the number of the staff at Soho had reached 600.

At this point, Erasmus Darwin (the grandfather of Charles Darwin) introduced James Watt to Matthew Boulton, and they formed a partnership for the development of the steam engine. The high quality of craftsmanship and engineering skill which Matthew Boulton was able to put at Watt's disposal allowed the young inventor to turn his great idea into a reality. However, progress was slow, and the original patent was running out.

Boulton skillfully lobbied in Parliament for an extension of the patent and, as James Watt put it, "Mr. Boulton's amiable and friendly character, together with his fame as an ingenious and active manufacturer procured me many and very active friends in both houses of Parliament".

In 1775, the firm of Boulton and Watt was granted an extension of the master steam engine patent until 1800. From a legal and financial standpoint, the way was now clear for the development of the engine; and a major technical difficulty was overcome when the Birmingham ironmaster and cannon-maker, John Wilkinson, invented a method for boring large cylinders accurately by fixing the cutting tool to a very heavy and stable boring shaft.

By 1780, Boulton and Watt had erected 40 engines, about half of which pumped water from the deep Cornish tin mines. Even their early models were at least four times as efficient as the Newcomen engine, and Watt continually improved the design. At Boulton's urging, James Watt designed rotary engines, which could be used for driving mills; and he also invented a governor to regulate the speed of his engines, thus becoming a pioneer of automation. By the time its patent of the separate condenser had run out in 1800, the firm of Boulton and Watt had made 500 engines. After 1800, the rate of production of steam engines became exponential, and when James Watt died in 1819, his inventions had given employment, directly or indirectly, to an estimated two million people.

The Soho manufactory became an almost obligatory stop on any distinguished person's tour of England. Samuel Johnson, for example, wrote that he was received at Soho with great civility; and Boswell, who visited Soho on another occasion, was impressed by "the vastness and contrivance" of the machinery. He wrote that he would never forget Matthew Boulton's words to him as they walked together through the manufactory: "I sell here, Sir, what all the world desires to have - Power!"

12.2 Working conditions

Both Matthew Boulton and James Watt were model employers as well as pioneers of the factory system. Boulton had a pension scheme for his men, and he made every effort to insure that they worked under comfortable conditions. However, when he died in 1809, the firm of Boulton and Watt was taken over by his son, Matthew Robbinson Boulton, in partnership with James Watt Jr. The two sons did not have their fathers' sense of social responsibility; and although they ran the firm very efficiently, they seemed to be more interested in profit-making than in the welfare of their workers.

A still worse employer was Richard Arkwright (1732-1792), who held patents on a series of machines for carding, drawing and spinning silk, cotton, flax and wool. He was a rough, uneducated man, who rose from humble origins to become a multimillionaire by driving himself almost as hard as he drove his workers. Arkwright perfected machines (invented by others) which could make extremely cheap and strong cotton thread; and as a result, a huge cotton manufacturing industry grew up within the space of a few years. The growth of the cotton industry was especially rapid after Arkwright's patent expired in 1785.

Crowds of workers, thrown off the land by the Enclosure Acts and by the Clearances in Scotland, flocked to the towns, seeking work in the new factories[1]. Wages fell to a near-starvation level, hours of work increased, and working conditions deteriorated. Dr. Peter Gaskell, writing in 1833, described the condition of the English mill workers as follows:

"The vast deterioration in personal form which has been brought about in the manufacturing population during the last thirty years... is singularly impressive, and fills the mind with contemplations of a very painful character... Their complexion is sallow and pallid, with a peculiar flatness of feature caused by the want of a proper quantity of adipose substance to cushion out the cheeks. Their stature is low - the average height of men being five feet, six inches... Great numbers of the girls and women walk lamely or awkwardly... Many of the men have but little beard, and that in patches of a few hairs... (They have) a spiritless and dejected air, a sprawling and wide action of the legs..."

"Rising at or before daybreak, between four and five o'clock the year round, they swallow a hasty meal or hurry to the mill without taking any food whatever... At twelve o'clock the engine stops, and an hour is given for dinner... Again they are closely immured from one o'clock till eight or nine, with the exception of twenty minutes, this being allowed for tea. During the whole of this long period, they are actively and unremittingly engaged in a crowded room at an elevated temperature."

[1]During the Highland Clearances, families that had farmed the land for generations were violently forced to leave their houses, which were then burned to prevent return. The land was afterward used as pasturage for sheep, which had been found to be more profitable. Donald McLeod, a crofter (small farmer) in Sutherland, has left the following account of the Clearances in his district: "The consternation and confusion were extreme. Little or no time was given for the removal of persons or property; the people striving to remove the sick and helpless before the fire should reach them; next, struggling to save the most valuable of their effects. The cries of the women and children, the roaring of the affrighted cattle, hunted at the same time by the yelling dogs of the shepherds amid the smoke and fire, altogether presented a scene that completely baffles description - it required to be seen to be believed... The conflagration lasted six days, until the whole of the dwellings were reduced to ashes or smoking ruins."

Figure 12.4: **London during the industrial revolution.**

Dr. Gaskell described the housing of the workers as follows:

"One of the circumstances in which they are especially defective is that of drainage and water-closets. Whole ranges of these houses are either totally undrained, or very partially... The whole of the washings and filth from these consequently are thrown into the front or back street, which, often being unpaved and cut into deep ruts, allows them to collect into stinking and stagnant pools; while fifty, or even more than that number, having only a single convenience common to them all, it is in a very short time choked with excrementous matter. No alternative is left to the inhabitants but adding this to the already defiled street."

"It frequently happens that one tenement is held by several families... The demoralizing effects of this utter absence of domestic privacy must be seen before they can be thoroughly appreciated. By laying bare all the wants and actions of the sexes, it strips them of outward regard for decency - modesty is annihilated - the father and the mother, the brother and the sister, the male and female lodger, do not scruple to commit acts in front of each other which even the savage keeps hid from his fellows."

"Most of these houses have cellars beneath them, occupied - if it is possible to find a lower class - by a still lower class than those living above them."

The following extract from John Fielden's book, *The Curse of the Factory System* (1836), describes the condition of young children working in the cotton industry:

"It is well known that Arkwright's (so called at least) inventions took manufactures out of the cottages and farmhouses of England... and assembled them in the counties

of Derbyshire, Nottinghamshire and more particularly, in Lancashire, where the newly-invented machinery was used in large factories built on the side of streams capable of turning the water wheel. Thousands of hands were suddenly required in these places, remote from towns."

"The small and nimble fingers of children being by far the most in request, the custom instantly sprang up of procuring 'apprentices' from the different parish workhouses of London, Birmingham and elsewhere... Overseers were appointed to see to the works, whose interest it was to work the children to the utmost, because their pay was in proportion to the quantity of work which they could exact."

"Cruelty was, of course, the consequence; and there is abundant evidence on record to show that in many of the manufacturing districts, the most heart-rending cruelties were practiced on the unoffending and friendless creatures... that they were flogged, fettered and tortured in the most exquisite refinement of cruelty, that they were, in many cases, starved to the bone while flogged to their work, and that even in some instances they were driven to commit suicide... The profits of manufacture were enormous; but this only whetted the appetite it should have satisfied."

The misery of factory workers in England during the early phases of the Industrial Revolution prompted the writings of Karl Marx (1818-1883) and Frederich Engels (1820-1895). Engels' book, *The condition of the Working Class in England*, was published in 1844. *The Communist Manifesto*, (*Manifest der Komunistischen Partei*), on which Marx and Engels collaborated, was published in 1848, while Marx's large book, *Das Kapital. Kritik der politischen Oekonomie* was printed in 1867.

One of the arguments which was used to justify the abuse of labor was that the alternative was starvation. The population of Europe had begun to grow rapidly for a variety of reasons: - because of the application of scientific knowledge to the prevention of disease; because the potato had been introduced into the diet of the poor; and because bubonic plague had become less frequent after the black rat had been replaced by the brown rat, accidentally imported from Asia.

It was argued that the excess population could not be supported unless workers were employed in the mills and factories to produce manufactured goods, which could be exchanged for imported food. In order for the manufactured goods to be competitive, the labor which produced them had to be cheap: hence the abuses. (At least, this is what was argued).

12.3 The slow acceptance of birth control in England

Industrialization benefited England, but in a very uneven way, producing great wealth for some parts of society, but also extreme misery in other social classes. For many, technical progress by no means led to an increase of happiness. The persistence of terrible poverty in 19th-century England, and the combined pessimism of Ricardo and Malthus, caused Thomas Carlyle to call economics "the Dismal Science".

Fortunately, Ricardo's "Iron Law of Wages" seems to have rusted over the years. Ap-

parently it was not an eternal law, but only a description of a passing phase of industrialism, before the appropriate social and legislative adjustments had been made. Among the changes which were needed to insure that the effects of technical progress became beneficial rather than harmful, the most important were the abolition of child labor, the development of unions, the minimum wage law, and the introduction of birth control.

Francis Place (1771-1854), a close friend of William Godwin and James Mill, was one of the earliest and most courageous pioneers of these needed changes. Place had known extreme poverty as a child, but he had risen to become a successful businessman and a leader of the trade union movement.

Place and Mill were Utilitarians, and like other members of this movement they accepted the demographic studies of Malthus while disagreeing with Malthus' rejection of birth control. They reasoned that since abortion and infanticide were already widely used by the poor to limit the size of their families, it was an indication that reliable and humane methods of birth control would be welcome. If marriage could be freed from the miseries which resulted from excessive numbers of children, the Utilitarians believed, prostitution would become less common, and the health and happiness of women would be improved.

Francis Place and James Mill decided that educational efforts would be needed to make the available methods of birth control more widely known and accepted. In 1818, Mill cautiously wrote "The great problem of a real check to population growth has been miserably evaded by all those who have meddled with the subject... And yet, if the superstitions of the nursery were discarded, and the principle of utility kept steadily in view, a solution might not be very difficult to be found."

A few years later, Mill dared to be slightly more explicit: "The result to be aimed at", he wrote in his *Elements of Political Economy* (1821), "is to secure to the great body of the people all the happiness which is capable of being derived from the matrimonial union, (while) preventing the evils which the too rapid increase of their numbers would entail. The progress of legislation, the improvement of the education of the people, and the decay of superstition will, in time, it may be hoped, accomplish the difficult task of reconciling these important objects."

In 1822, Francis Place took the considerable risk of publishing a four-page pamphlet entitled *To the Married of Both Sexes of the Working People*, which contained the following passages:

"It is a great truth, often told and never denied, that when there are too many working people in any trade or manufacture, they are worse paid than they ought to be paid, and are compelled to work more hours than they ought to work. When the number of working people in any trade or manufacture has for some years been too great, wages are reduced very low, and the working people become little better than slaves."

"When wages have thus been reduced to a very small sum, working people can no longer maintain their children as all good and respectable people wish to maintain their children, but are compelled to neglect them; - to send them to different employments; - to Mills and Manufactories, at a very early age. The miseries of these poor children cannot be described, and need not be described to you, who witness them and deplore them every day of your lives."

Figure 12.5: **Annie Besant.**

"The sickness of yourselves and your children, the privation and pain and premature death of those you love but cannot cherish as you wish, need only be alluded to. You know all these evils too well."

"And what, you will ask, is the remedy? How are we to avoid these miseries? The answer is short and plain: the means are easy. Do as other people do, to avoid having more children than they wish to have, and can easily maintain."

"What is to be done is this. A piece of soft sponge is tied by a bobbin or penny ribbon, and inserted just before the sexual intercourse takes place, and is withdrawn again as soon as it has taken place. Many tie a sponge to each end of the ribbon, and they take care not to use the same sponge again until it has been washed. If the sponge be large enough, that is, as large as a green walnut, or a small apple, it will prevent conception... without diminishing the pleasures of married life..."

"You cannot fail to see that this address is intended solely for your good. It is quite impossible that those who address you can receive any benefit from it, beyond the satisfaction

which every benevolent person and true Christian, must feel, at seeing you comfortable, healthy and happy."

The publication of Place's pamphlet in 1822 was a landmark in the battle for the acceptance of birth control in England. Another important step was taken in 1832, when a small book entitled *The Fruits of Philosophy or, the Private Companion of Young Married People* was published by a Boston physician named Dr. Charles Knowlton. The book contained simple contraceptive advice. It reviewed the various methods of birth control available at the time. In order for the sponge method to be reliable, Knowlton's book pointed out, use of a saline douching solution was necessary.

For a number of years, a reprinted edition of Knowlton's book was sold openly in London. However, in 1876 a new law against obscene publications was passed, and a bookseller was sentenced to two year's imprisonment for selling *The Fruits of Philosophy*. Charles Bradlaugh, a liberal politician and editor, and his friend, the feminist author Mrs. Annie Besant, then decided to sell the book themselves in order to provoke a new trial. The Chief Clerk of the Magistrates, the Detective Department, and to the City Solicitor, were all politely informed of the time and place where Charles Bradlaugh and Annie Besant intended to sell Knowlton's book, and the two reformers asked to be arrested.

In the historic trial that followed, the arguments of Malthus were used, not only by Charles Bradlaugh, who conducted his own defense, but also by the Lord Chief Justice, who instructed the jury to acquit the defendants. In the end, the jury ruled that the motives of Besant and Bradley were above reproach. However, the issue was made less clear when the jury also ruled Knowlton's book to be obscene. The enormous publicity that accompanied the trial certainly did not harm the sales of the book!

As birth control was gradually accepted in England, the average number of children per marriage fell from 6.16 in the 1860's to 4.13 in the 1890's. By 1915 the figure had fallen to 2.43. At the same time, trade unions developed, and improved social legislation was enacted. For all of these reasons, conditions improved for the English workers.

12.4 The Industrial Revolution

The development of printing in Europe produced a brilliant, chainlike series of scientific discoveries. During the 17th century, the rate of scientific progress gathered momentum, and in the 18th and 19th centuries, the practical applications of scientific knowledge revolutionized the methods of production in agriculture and industry.

The changes produced by the Industrial Revolution at first resulted in social chaos - enormous wealth in some classes of society, and great suffering in other classes; but later, after the appropriate social and political adjustments had been made, the improved methods of production benefited all parts of society in a more even way.

The Industrial Revolution marked the start of massive human use of fossil fuels. The stored energy from several hundred million years of plant growth began to be used at roughly a million times the rate at which it had been formed. The effect on human society was like that of a narcotic. There was a euphoric (and totally unsustainable) surge of

Figure 12.6: **And was Jerusalem builded here, among these dark Satanic mills?**

growth of both population and industrial production. Meanwhile, the carbon released into the atmosphere from the burning of fossil fuels began to duplicate the conditions which led to the 5 geologically-observed mass extinctions, during each of which more than half of all living species disappeared forever.

12.5 Technical change

We have just seen how the development of printing in Europe produced a brilliant, chainlike series of scientific discoveries. During the 17th century, the rate of scientific progress gathered momentum, and in the 18th and 19th centuries, the practical applications of scientific knowledge revolutionized the methods of production in agriculture and industry.

The changes produced by the industrial revolution at first resulted in social chaos - enormous wealth in some classes of society, and great suffering in other classes; but later, after the appropriate social and political adjustments had been made, the improved methods of production benefited all parts of society in a more even way.

There is, in fact, a general pattern which we can notice in the social impact of technology: Technical changes usually occur rapidly, while social and political adjustments take more time. The result is an initial period of social disruption following a technical change, which continues until the structure of society has had time to adjust. Thus, for example, the introduction of a money-based economy into a society which has previously been based on a pattern of traditional social duties always creates an initial period of painful disruption.

In the case of the Industrial Revolution, feudal society, with its patterns of village life and its traditional social obligations, was suddenly replaced by an industrial society whose rules were purely economic, and in which labor was regarded as a commodity. At first, the change produced severe social disruption and suffering; but now, after two centuries of social and political adjustment, the industrialized countries are generally considered to have benefited from the change.

Cullen, Black and Watt

The two driving forces behind the Industrial Revolution were world trade and scientific discovery. During the 18th century, both these forces were especially strongly felt in Scotland and in the north-western part of England. The distilling industry in Scotland grew enormously because of world trade; and the resulting interest in what happens when liquids are vaporized and condensed produced one of the major scientific and technical developments of the Industrial Revolution.

The first step in this development was taken by William Cullen, a professor of medicine at the universities of Glasgow and Edinburgh. In a paper entitled *Of the Cold Produced by Evaporation* (1749), Cullen wrote that he had noticed that "...water and some other liquids, in evaporating, produce some degree of cold".

Cullen therefore began to make experiments in which he dipped a thermometer in and out of a liquid and observed the drop in temperature. He noticed that the effect was increased by "...moving the thermometer very nimbly to and fro in the air; or if, while the ball was wet with spirit of wine, it was blown upon with a pair of bellows". In this way, Cullen achieved a temperature 44 degrees below the freezing point of water. He next tried producing vacuums above various liquids with the help of an air pump:

"We set the vessel containing the ether", Cullen wrote, "In another a little larger, containing water. Upon exhausting the receiver and the vessel's remaining a few minutes *in vacuo*, we found the most part of the water frozen, and the vessel containing the ether surrounded with a thick crust of ice."

One of Cullen's favorite students at Edinburgh was Joseph Black (1728-1799). He became Cullen's scientific assistant, and later, in 1756, he was elected to the Chair of Medicine at Glasgow University. Continuing Cullen's work on the cold produced by evaporating liquids, Black discovered and studied quantitatively the phenomenon of latent heats, e.g., the very large quantities of heat which are necessary to convert ice into water, or to convert water into steam.

Black was led to his discovery of latent heats not only by Cullen's work, but also by his own observations on Scottish weather. Writing of the discovery, one of Black's friends at Glasgow recorded that "...since a fine winter day of sunshine did not at once clear the hills of snow, nor a frosty night suddenly cover the ponds with ice, Dr. Black was already convinced that much heat was absorbed and fixed in the water which slowly trickled from the wreaths of snow; and on the other hand, that much heat emerged from it while it was slowly changing into ice. For, during a thaw, a thermometer will always sink when removed

from the air into melting snow; and during a severe frost it will rise when plunged into freezing water. Therefore in the first case, the snow is receiving heat, and in the last, the water is allowing it to emerge again."

At Glasgow University, where Joseph Black was Professor of Medicine, there was a shop where scientific instruments were made and sold. The owner of the shop was a young man named James Watt (1736-1819), who came from a family of ship builders and teachers of mathematics and navigation. Besides being an extremely competent instrument maker, Watt was a self-taught scientist of great ability, and his shop became a meeting place for scientifically inclined students. Dr. Black was also a frequent visitor to Watt's shop, and a strong friendship formed between the professor and the highly intelligent young instrument maker.

In 1763, Glasgow University asked James Watt to repair a model of a Newcomen steam engine. This type of steam engine had been used for several years to pump water out of mines. It had a single cylinder which filled with steam so that the piston was driven to one end. Then water was sprayed into the cylinder, condensing the steam; and the vacuum drew the piston back to the other end of the cylinder, thus completing the cycle.

James Watt tried to repair the university's small-scale model of the Newcomen engine, but he failed to make it work well. He could see that it was extraordinarily inefficient in its use of fuel, and he began making experiments to find out why it was so wasteful. Because of James Watt's friendship with Joseph Black, he quickly found the answer in the phenomena of latent heats and specific heats: The engine was inefficient because of the large amounts of energy needed to convert water into steam and to heat the iron cylinder.

In 1765, Watt designed an improved engine with a separate condenser. The working cylinder could then be kept continuously hot, and the condensing steam could be returned through the boiler, so that its latent heat could be used to preheat the incoming water. To have an idea for a new, energy-saving engine was one thing, however, and to make the machine practical was another. James Watt had experience as instrument maker, but no experience in large-scale engineering.

In 1767, Watt was engaged to make a survey for a canal which was to join the Forth and the Clyde through Loch Lomond. Because of this work, he had to make a trip to London to explain the canal project to a parliamentary committee; and on the return trip he met Dr. Erasmus Darwin in Birmingham. Darwin, who was interested in steam engines, quickly recognized Watt's talent and the merit of his idea.

Erasmus Darwin (1731-1802) was the most famous physician of the period, but his interests were by no means confined to medicine. He anticipated his grandson, Charles Darwin, by developing the first reasonably well thought-out theory of evolution; and, at the time when he met James Watt he was enthusiastically trying to design a steam locomotive. His collaborators in this project were Benjamin Franklin and the pioneering Birmingham industrialist, Matthew Boulton.

In August, 1767, Erasmus Darwin wrote to Watt: "The plan of your steam improvements I have religiously kept secret, but begin to see myself some difficulties in your execution, which did not strike me when you were here. I have got another and another hobby horse since I saw you. I wish that the Lord would send you to pass a week with me,

and Mrs. Watt with you; - a week, a month, a year!"

Dr. Darwin introduced James Watt to Matthew Boulton, and a famous partnership was formed. The partnership of Boulton and Watt was destined to make the steam engine practical, and thus to create a new age - an age in which humans would would rely for power neither on their own muscles nor on the muscles of slaves, but would instead control almost unlimited power through their engines.

James Watt was lucky to meet Erasmus Darwin and to be introduced to Matthew Boulton, since Boulton was the most talented and progressive manufacturer in England - the best possible man to understand the significance of Watt's great invention and to help in its development.

Boulton

Matthew Boulton was the son of a Birmingham manufacturer, and at the age of seventeen, he had invented a type of metal buckle inlaid with glass, which proved to be extremely popular and profitable. By the time that he was twenty-one, his father had made him manager of the business. At twenty-eight, Matthew Boulton married an heiress, receiving a very large dowry. When his wife died four years later, Boulton married her younger sister, and he was given a second large fortune.

Instead of retiring from manufacturing and becoming a country gentleman, as most of his contemporaries would have done, Boulton used his wealth to try out new ideas. He tried especially to improve the quality of the goods manufactures in Birmingham. Since he was already an extremely rich man, he was more interested in applying art and science to manufacturing than he was in simply making money.

Boulton's idea was to bring together under one roof the various parts of the manufacturing process which had been scattered among many small workshops by the introduction of division of labor. He believed that improved working conditions would result in an improved quality of products.

With these ideas in mind, Matthew Boulton built a large mansion-like house on his property at Soho, outside Birmingham, and installed in it all the machinery necessary for the complete production of a variety of small steel products. Because of his personal charm, and because of the comfortable working conditions at the Soho Manufactory, Boulton was able to attract the best and most skillful craftsmen in the region; and by 1765, the number of the staff at Soho had reached 600.

Boulton continued to manufacture utilitarian goods, on which he made a profit, but he also introduced a line of goods of high artistic merit on which he gained prestige but lost money. He made fine gilt brass candelabra for both George III and Catherine the Great; and he was friendly with George III, who consulted him on technical questions.

At this point, Erasmus Darwin introduced James Watt to Matthew Boulton, and they formed a partnership for the development of the steam engine. The high quality of craftsmanship and engineering skill which Matthew Boulton was able to put at Watt's disposal allowed the young inventor to turn his great idea into a reality. However, progress was

slow, and the original patent was running out.

Boulton skillfully lobbied in Parliament for an extension of the patent and, as James Watt put it, "Mr. Boulton's amiable and friendly character, together with his fame as an ingenious and active manufacturer procured me many and very active friends in both houses of Parliament".

In 1775, the firm of Boulton and Watt was granted an extension of the master steam engine patent until 1800. From a legal and financial standpoint, the way was now clear for the development of the engine; and a major technical difficulty was overcome when the Birmingham ironmaster and cannon-maker, John Wilkinson, invented a method for boring large cylinders accurately by fixing the cutting tool to a very heavy and stable boring shaft.

By 1780, Boulton and Watt had erected 40 engines, about half of which pumped water from the deep Cornish tin mines. Even their early models were at least four times as efficient as the Newcomen engine, and Watt continually improved the design. At Boulton's urging, James Watt designed rotary engines, which could be used for driving mills; and he also invented a governor to regulate the speed of his engines, thus becoming a pioneer of automation. By the time its patent of the separate condenser had run out in 1800, the firm of Boulton and Watt had made 500 engines. After 1800, the rate of production of steam engines became exponential, and when James Watt died in 1819, his inventions had given employment, directly or indirectly, to an estimated two million people.

The Soho manufactory became an almost obligatory stop on any distinguished person's tour of England. Samuel Johnson, for example, wrote that he was received at Soho with great civility; and Boswell, who visited Soho on another occasion, was impressed by "the vastness and contrivance" of the machinery. He wrote that he would never forget Matthew Boulton's words to him as they walked together through the manufactory: "I sell here, Sir, what all the world desires to have - Power!"

12.6 The Lunar Society

Matthew Boulton loved to entertain; and he began to invite his friends in science and industry to regular dinners at his home. At these dinners, it was understood by all the guests that science and philosophy were to be the topics of the conversation. This group of friends began to call themselves the "Lunar Society", because of their habit of meeting on nights when the moon was full so that they could find their way home easily afterwards.

During the early stages of the Industrial Revolution, the Lunar Society of Birmingham played a role in the development of scientific ideas which was almost as important as the role played by the Royal Society of London at the time of Isaac Newton. Among the members of this group of friends, besides Erasmus Darwin and James Watt, were the inventive and artistic pottery manufacturer, Josiah Wedgwood (the other grandfather of Charles Darwin), and the author, chemist and Unitarian minister, Joseph Priestley (1733-1804).

Joseph Priestley's interests were typical of the period: The center of scientific attention had shifted from astronomy to the newly-discovered phenomena of electricity, heat and chemistry, and to the relationship between them. Priestly, who was a prolific and popular

author of books on many topics, decided to write a *History of Electricity*. He not only collected all the results of previous workers in an organized form, but also, while repeating their experiments, he made a number of original discoveries. For example, Joseph Priestley was the first to discover the inverse square law of attraction and repulsion between electrical charges, a law which was later verified by the precise experiments of Henry Cavendish (1731-1810) and Charles Coulomb (1736-1806).

The chemistry of gases was also very much in vogue during this period. Joseph Black's medical thesis at Edinburgh University had opened the field with an elegant quantitative treatment of chemical reactions involving carbon dioxide. Black had shown that when chalk (calcium carbonate) is heated, it is changed into a caustic residue (calcium oxide) and a gas (carbon dioxide).

Black had carefully measured the weight lost by the solid residue when the gas was driven off, and he had shown that precisely the same weight was regained by the caustic residue when it was exposed to the atmosphere and reconverted to chalk. His work suggested not only that weight is conserved in chemical reactions, but also that carbon dioxide is present in the atmosphere. Black's work had initiated the use of precise weighing in chemistry, a technique which later was brought to perfection by the great French chemist, Anton Lavoisier (1743-1794).

Joseph Priestley, (who had been supplied with a large burning-glass by his brother-in-law, the wealthy ironmaster, John Wilkinson), carried out an experiment similar to Black's. He used the glass to focus the rays of the sun on a sample of what we now call red oxide of mercury. He collected the gas which was driven off, and tested its properties, recording that "...what surprized me more than I can well express was that a candle burned in this air with a remarkably vigorous flame". He also found that a mouse could live much longer in the new gas than in ordinary air.

On a trip to France, Priestley communicated these results to Antoine Lavoisier, who named the gas "oxygen" and established fully its connection with combustion and respiration. At almost the same time, the Swedish chemist, Karl Wilhelm Scheele (1742-1786), discovered oxygen independently.

Joseph Priestley isolated and studied nine other new gases; and he invented the technique of collecting gases over mercury. This was much better than collecting them over water, since the gases did not dissolve in mercury. He extended Joseph Black's studies of carbon dioxide, and he invented a method for dissolving carbon dioxide in beverages under pressure, thus becoming the father of the modern soft drink industry!

The tremendous vogue for gas chemistry in the late 18th century can also be seen in the work of the eccentric multimillionaire scientist, Henry Cavendish, who discovered hydrogen by dissolving metals in acids, and then showed that when hydrogen is burned in oxygen, the resulting compound is pure water. Cavendish also combined the nitrogen in the atmosphere with oxygen by means of electrical sparks. The remaining bubble of atmospheric gas, which stubbornly refused to combine with oxygen, was later shown to be a new element - argon.

The great interest in gas chemistry shown by intelligent people of the period can be seen in Josiah Wedgwood's suggestions to the painter, George Stubbs, who was commissioned

to make a portrait of Wedgwood's children:

"The two family pieces I have hinted at, I mean to contain the children only, and grouped perhaps in some such manner as this - Sukey playing upon her harpsichord with Kitty singing to her, as she often does, and Sally and Mary Ann upon the carpet in some employment suitable to their ages. This to be one picture. The pendant to be Jack standing at a table making fixable air with the glass apparatus etc., and his two brothers accompanying him, Tom jumping up and clapping his hands in joy, and surprized at seeing the stream of bubbles rise up just as Jack has put a little chalk to the acid. Jos with the chemical dictionary before him in a thoughtful mood; which actions will be exactly descriptive of their respective characters."

The force of feudal traditions was still so strong, however, that in spite of Josiah Wedgwood's suggestions, George Stubbs painted the children on horseback, looking precisely like the children of a traditional landlord. The "fixable air" which Wedgwood mentions was the contemporary word for carbon dioxide. Josiah Wedgwood's daughter, Sukey (Susannah), was destined to become the mother of the greatest biologist of all time, Charles Darwin.

12.7 Adam Smith

One of Joseph Black's best friends at Glasgow University was the Professor of Moral Philosophy, Adam Smith. In 1759, Smith published a book entitled *The Theory of Moral Sentiments*, which was subtitled: *An Essay towards an Analysis of the Principles by which Men naturally judge concerning the Conduct and Character, first of their Neighbors, and afterwards of themselves.*

In this book, Adam Smith pointed out that people can easily judge the conduct of their neighbors. They certainly know when their neighbors are treating them well, or badly. Having learned to judge their neighbors, they can, by analogy, judge their own conduct. They can tell when they are mistreating their neighbor or being kind by asking themselves: "Would I want him to do this to me?" As Adam Smith put it:

"Our continual observations upon the conduct of others insensibly lead us to form to ourselves certain general rules concerning what is fit and proper to be done or avoided... It is thus the general rules of morality are formed."

When we are kind to our neighbors, they maintain friendly relations with us; and to secure the benefits of their friendship, we are anxious to behave well towards other people. Thus, according to Adam Smith, enlightened self-interest leads men and women to moral behaviour.

In 1776, Adam Smith published another equally optimistic book, with a similar theme: *The Wealth of Nations.* In this book, he examined the reasons why some nations are more prosperous than others. Adam Smith concluded that the two main factors in prosperity are division of labor and economic freedom.

As an example of the benefits of division of labor, he cited the example of a pin factory, where ten men, each a specialist in a particular manufacturing operation, could produce 48,000 pins per day. One man drew the wire, another straightened it, a third pointed the

pins, a fourth put on the heads, and so on. If each man had worked separately, doing all the operations himself, the total output would be far less. The more complicated the manufacturing process (Smith maintained), the more it could be helped by division of labor. In the most complex civilizations, division of labor has the greatest utility.

Adam Smith believed that the second factor in economic prosperity is economic freedom, and in particular, freedom from mercantilist government regulations. He believed that natural economic forces tend to produce an optimum situation, in which each locality specializes in the economic operation for which it is best suited.

Smith believed that when each individual aims at his own personal prosperity, the result is the prosperity of the community. A baker does not consciously set out to serve society by baking bread - he only intends to make money for himself; but natural economic forces lead him to perform a public service, since if he were not doing something useful, people would not pay him for it. Adam Smith expressed this idea in the following way:

"As every individual, therefore, endeavours as much as he can, both to employ his capital in support of domestic industry, and so to direct that industry that its produce may be of greatest value, each individual necessarily labours to render the annual revenue of the Society as great as he can."

"He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain; and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for Society that it was no part of it. By pursuing his own interest, he frequently promotes that of society more effectively than when he really intends to promote it."

In Adam Smith's optimistic view, an "invisible hand" guides individuals to promote the public good, while they consciously seek only their own gain. This vision was enthusiastically adopted adopted by the vigorously growing industrial nations of the west. It is the basis of much of modern history; but there proved to be shortcomings in Smith's theory. A collection of individuals, almost entirely free from governmental regulation, each guided only by his or her desire for personal gain - this proved to be a formula for maximum economic growth; but certain modifications were needed before it could lead to widely shared happiness and social justice.

The dark, Satanic mills

Both Matthew Boulton and Josiah Wedgwood were model employers as well as pioneers of the factory system. Matthew Boulton had a pension scheme for his men, and he made every effort to insure that they worked under comfortable conditions. However, when he died in 1809, the firm of Boulton and Watt was taken over by his son, Matthew Robbinson Boulton, in partnership with James Watt Jr.. The two sons did not have their fathers' sense of social responsibility; and although they ran the firm very efficiently, they seemed

to be more interested in profit-making than in the welfare of their workers.

A still worse employer was Richard Arkwright (1732-1792), who held patents on a series of machines for carding, drawing and spinning silk, cotton, flax and wool. He was a rough, uneducated man, who rose from humble origins to become a multimillionaire by driving himself almost as hard as he drove his workers. Arkwright perfected machines (invented by others) which could make extremely cheap and strong cotton thread; and as a result, a huge cotton manufacturing industry grew up within the space of a few years. The growth of the cotton industry was especially rapid after Arkwright's patent expired in 1785.

Crowds of workers, thrown off the land by the Enclosure Acts, flocked to the towns, seeking work in the new factories. Wages fell to a near-starvation level, hours of work increased, and working conditions deteriorated. Dr. Peter Gaskell, writing in 1833, described the condition of the English mill workers as follows:

"The vast deterioration in personal form which has been brought about in the manufacturing population during the last thirty years... is singularly impressive, and fills the mind with contemplations of a very painful character... Their complexion is sallow and pallid, with a peculiar flatness of feature caused by the want of a proper quantity of adipose substance to cushion out the cheeks. Their stature is low - the average height of men being five feet, six inches... Great numbers of the girls and women walk lamely or awkwardly... Many of the men have but little beard, and that in patches of a few hairs... (They have) a spiritless and dejected air, a sprawling and wide action of the legs..."

"Rising at or before daybreak, between four and five o'clock the year round, they swallow a hasty meal or hurry to the mill without taking any food whatever... At twelve o'clock the engine stops, and an hour is given for dinner... Again they are closely immured from one o'clock till eight or nine, with the exception of twenty minutes, this being allowed for tea. During the whole of this long period, they are actively and unremittingly engaged in a crowded room at an elevated temperature."

Dr. Gaskell described the housing of the workers as follows:

"One of the circumstances in which they are especially defective is that of drainage and water-closets. Whole ranges of these houses are either totally undrained, or very partially... The whole of the washings and filth from these consequently are thrown into the front or back street, which, often being unpaved and cut into deep ruts, allows them to collect into stinking and stagnant pools; while fifty, or even more than that number, having only a single convenience common to them all, it is in a very short time choked with excrementous matter. No alternative is left to the inhabitants but adding this to the already defiled street."

"It frequently happens that one tenement is held by several families... The demoralizing effects of this utter absence of domestic privacy must be seen before they can be thoroughly appreciated. By laying bare all the wants and actions of the sexes, it strips them of outward regard for decency - modesty is annihilated - the father and the mother, the brother and the sister, the male and female lodger, do not scruple to commit acts in front of each other which even the savage keeps hid from his fellows."

"Most of these houses have cellers beneath them, occupied - if it is possible to find a lower class - by a still lower class than those living above them."

The abuse of child labor was one of the worst features of early industrialism in England. Sometimes small children, starting at the age of six or seven, were forced to work, because wages were so low that the family would otherwise starve; and sometimes the children were orphans, taken from parish workhouses. The following extract from John Fielden's book, *The Curse of the Factory System* (1836), describes the condition of young children working in the cotton industry:

"It is well known that Arkwright's (so called at least) inventions took manufactures out of the cottages and farmhouses of England... and assembled them in the counties of Derbyshire, Nottinghamshire and more particularly, in Lancashire, where the newly-invented machinery was used in large factories built on the side of streams capable of turning the water wheel. Thousands of hands were suddenly required in these places, remote from towns."

"The small and nimble fingers of children being by far the most in request, the custom instantly sprang up of procuring 'apprentices' from the different parish workhouses of London, Birmingham and elsewhere... Overseers were appointed to see to the works, whose interest it was to work the children to the utmost, because their pay was in proportion to the quantity of work which they could exact."

"Cruelty was, of course, the consequence; and there is abundant evidence on record to show that in many of the manufacturing districts, the most heart-rending cruelties were practiced on the unoffending and friendless creatures... that they were flogged, fettered and tortured in the most exquisite refinement of cruelty, that they were, in many cases, starved to the bone while flogged to their work, and that even in some instances they were driven to commit suicide... The profits of manufacture were enormous; but this only whetted the appetite it should have satisfied."

One of the arguments which was used to justify the abuse of labor was that the alternative was starvation. The population of Europe had begun to grow rapidly for a variety of reasons: - because of the application of scientific knowledge to the prevention of disease; because the potato had been introduced into the diet of the poor; and because bubonic plague had become less frequent after the black rat had been replaced by the brown rat, accidentally imported from Asia.

It was argued that the excess population could not be supported unless workers were employed in the mills and factories to produce manufactured goods, which could be exchanged for imported food. In order for the manufactured goods to be competitive, the labor which produced them had to be cheap: hence the abuses. (At least, this is what was argued).

Overpopulation

When the facts about the abuse of industrial workers in England became known, there were various attempts to explain what had gone wrong with the optimistic expectations of the Enlightenment. Among the writers who discussed thi problem was the economist David Ricardo (1772-1823). In his book, *The Principles of Political Economy and Taxation*

(1817), Ricardo proposed his "iron law of wages".

According to Ricardo, labor is a commodity, and wages are determined by the law of supply and demand: When wages fall below the starvation level, the workers' children die. Labor then becomes a scarce commodity, and the wages rise. On the other hand, when wages rise above the starvation level, the working population multiplies rapidly, labor becomes a plentiful commodity, and wages fall again. Thus, according to Ricardo, there is an "iron law" which holds wages at the minimum level at which life can be supported.

Ricardo's reasoning assumes industrialists to be completely without social conscience or governmental regulation; it fails to anticipate the development of trade unionism; and it assumes that the working population will multiply without restraint as soon as their wages rise above the starvation level. This was an accurate description of what was happening in England during Ricardo's lifetime, but it obviously does not hold for all times and all places.

A more general and complete description of the situation was given by Thomas Robert Malthus (1766-1834). Malthus came from an intellectual family: His father, Daniel Malthus, was a friend of Rousseau, Hume and Goodwin. The famous book on population by the younger Malthus grew out of his conversations with his father.

Daniel Malthus was an enthusiastic believer in the optimistic philosophy of the Enlightenment. Like Goodwin, Condorcet and Voltaire, he believed that the application of scientific progress to agriculture and industry would inevitably lead humanity forward to a golden age. His son, Robert, was more pessimistic. He pointed out that the benefits of scientific progress would probably be eaten up by a growing population.

At his father's urging, Robert Malthus developed his ideas into a book, *An Essay on the Principle of Population*, which he published anonymously in 1798. In this famous book, Malthus pointed out that under optimum conditions, every biological population, including that of humans, is capable of increasing exponentially. For humans under optimum conditions, the population can double every twenty-five years, quadruple every fifty years and increase by a factor of 8 every seventy-five years. It can grow by a factor of 16 every century, and by a factor of 256 every two centuries, and so on.

Obviously, human populations cannot increase at this rate for very long, since if they did, the earth would be completely choked with people in a very few centuries. Therefore, Malthus pointed out, various forces must be operating to hold the population in check. Malthus listed first the "positive checks" to population growth - disease, famine and war - which we now call the "Malthusian forces". In addition, he listed checks of another kind - birth control (which he called "Vice"), late marriage, and "Moral Restraint". Being a clergyman, Malthus naturally favored moral restraint.

According to Malthus, a population need not outrun its food supply, provided that late marriage, birth control or moral restraint are practiced; but without these less painful checks, the population will quickly grow to the point where the grim Malthusian forces - famine, disease and war - begin to act.

Curiously, it was France, a Catholic country, which led the way in the development of birth control. Robert Owen (who was an enlightened English industrialist, and the founder of the cooperative movement), wished to advise his workers about birth control; and so

he went to France to learn about the techniques practiced there. In 1825, an article (by Richard Carlile) appeared in *The Republican.* The article described the importation of birth control from France to England as follows:

"...It was suggested to Mr. Owen that, in his new establishments, the healthy state of the inhabitants would tend to breed an excess of children. The matter was illustrated and explained to him, so that he felt the force of it. He was told that on the Continent, the women used some means of preventing conception which were uniformly successful. Mr. Owen set out for Paris to discover the process. He consulted the most eminent physicians, and assured himself of what was the common practice among their women."

"...A piece of soft sponge is tied by a bobbin or penny ribbon, and inserted before sexual intercourse takes place, and is withdrawn again as soon as it has taken place... If the sponge be large enough, that is, as large as a green walnut or a small apple, it will prevent conception, without diminishing the pleasures of married life."

Carlile goes on to say:

"...When the number of working people in any trade or manufacture has for some years been too great, wages are reduced very low, and the working people become little better than slaves... By limiting the number of children, the wages of both children and grown persons will rise; and the hours of working will be no more than they ought to be."

Birth control and late marriage have (until now) kept the grim predictions of Ricardo and Malthus from being fulfilled in the developed industrial nations of the modern world. Most of these nations have gone through a process known as the "demographic transition" - the shift from an equilibrium where population growth is held in check by the Malthusian forces of disease, starvation and war, to one where it is held in check by birth control and late marriage.

The transition begins with a fall in the death rate, caused by various factors, among which the most important is the application of scientific knowledge to the prevention of disease. Cultural patterns require some time to adjust to the lowered death rate, and so the birth rate continues to be high. Families continue to have six or seven children, just as they did when most of the children died before having children of their own. Therefore, at the start of the demographic transition, the population increases sharply. After a certain amount of time, however, cultural patterns usually adjust to the lowered death rate, and a new equilibrium is established, where both the birth rate and the death rate are low.

In Europe, this period of adjustment required about two hundred years. In 1750, the death rate began to fall sharply: By 1800, it had been cut in half, from 35 deaths per thousand people in 1750 to 18 in 1800; and it continued to fall. Meanwhile, the birth rate did not fall, but even increased to 40 births per thousand per year in 1800. Thus the number of children born every year was more than twice the number needed to compensate for the deaths!

By 1800, the population was increasing by more than two percent every year. In 1750, the population of Europe was 150 million; by 1800, it was roughly 220 million; by 1950 it had exceeded 540 million, and in 1970 it was 646 million.

Meanwhile the achievements of medical science and the reduction of the effects of famine and warfare had been affecting the rest of the world: In 1750, the non-European

population of the world was only 585 million. By 1850 it had reached 877 million. During the century between 1850 and 1950, the population of Asia, Africa and Latin America more than doubled, reaching 1.8 billion in 1950. In the twenty years between 1950 and 1970, the population of Asia, Africa and Latin America increased still more sharply, and in 1970, this segment of the world's population reached 2.6 billion, bringing the world total to 3.6 billion. The fastest increase was in Latin America, where population almost doubled during the twenty years between 1950 and 1970.

The latest figures show that the population explosion is leveling off in Europe, Russia, North America and Japan, where the demographic transition is almost complete. However, the population of the rest of the world is still increasing at a breakneck speed; and it cannot continue to expand at this rate for very much longer without producing widespread famine.

12.8 Colonialism

In the 18th and 19th centuries, the continually accelerating development of science and science-based industry began to affect the whole world. As the factories of Europe poured out cheap manufactured goods, a change took place in the patterns of world trade: Before the Industrial Revolution, trade routes to Asia had brought Asian spices, textiles and luxury goods to Europe. For example, cotton cloth and fine textiles, woven in India, were imported to England. With the invention of spinning and weaving machines, the trade was reversed. Cheap cotton cloth, manufactured in England, began to be sold in India, and the Indian textile industry withered.

The rapid development of technology in the west also opened an enormous gap in military strength between the industrialized nations and the rest of the world. Taking advantage of their superior weaponry, the advanced industrial nations rapidly carved the remainder of the world into colonies, which acted as sources of raw materials and food, and as markets for manufactured goods.

In North America, the native Indian population had proved vulnerable to European diseases, such as smallpox, and large numbers of them had died. The remaining Indians were driven westward by streams of immigrants arriving from Europe. In Central and South America, European diseases proved equally fatal to the Indians.

Often the industrialized nations made their will felt by means of naval bombardements: In 1854, Commodore Perry and an American fleet forced Japan to accept foreign traders by threatening to bombard Tokyo. In 1856, British warships bombarded Canton in China to punish acts of violence against Europeans living in the city. In 1864, a force of European and American warships bombarded Choshu in Japan, causing a revolution. In 1882, Alexandria was bombarded, and in 1896, Zanzibar.

Between 1800 and 1875, the percentage of the earth's surface under European rule increased from 35 percent to 67 percent. In the period between 1875 and 1914, there was a new wave of colonial expansion, and the fraction of the earth's surface under the domination of colonial powers (Europe, the United States and Japan) increased to 85 percent, if former colonies are included.

During the period between 1880 and 1914, English industrial and colonial dominance began to be challenged. Industrialism had spread from England to Belgium, Germany and the United States, and, to a lesser extent, to France, Italy, Russia and Japan. By 1914, Germany was producing twice as much steel as Britain, and the United States was producing four times as much.

New techniques in weaponry were introduced, and a naval armaments race began among the major industrial powers. The English found that their old navy was obsolete, and they had to rebuild. Thus, the period of colonial expansion between 1880 and 1914 was filled with tensions, as the industrial powers raced to arm themselves in competition with each other, and raced to seize as much as possible of the rest of the world.

Much that was beautiful and valuable was lost, as mature traditional cultures collapsed, overcome by the power and temptations of modern industrial civilization. For the Europeans and Americans of the late 19th century and early 20th century, progress was a religion, and imperialism was its crusade. The cruelties of the crusade were justified, in the eyes of the westerners, by their mission to "civilize" and Christianize the rest of the world. To a certain extent, the industrial countries were right in feeling that they had something of value to offer to the rest of the world; and among the people whom they sent out were educators and medical workers who often accepted lives of extreme discomfort and danger in order to be of service.

At the beginning of the 19th century, the world was divided into parts: China was a world in itself; India was a separate world; Africa south of the Sahara was another enclosed world; and the Islamic world was also self-contained, as was the west. By 1900, there was only one world, bound together by constantly-growing ties of trade and communication.

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