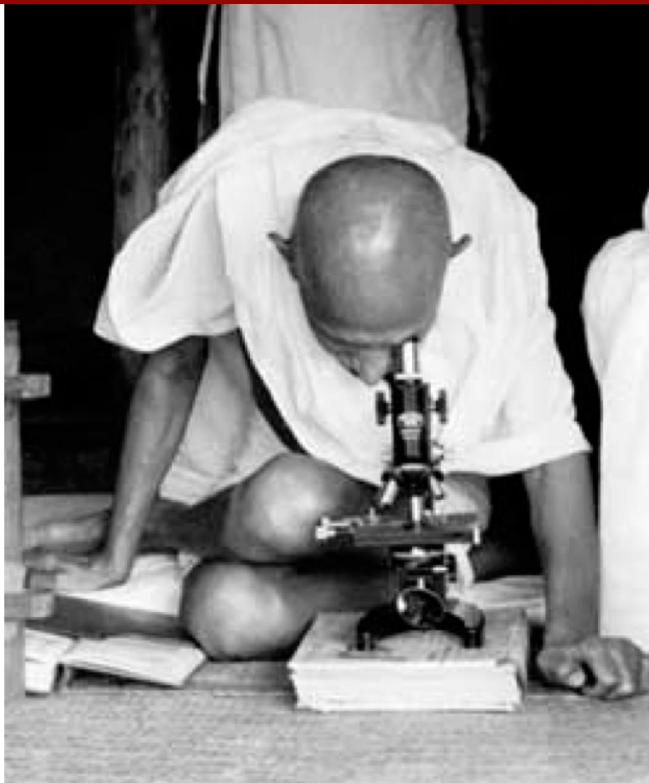


SCIENCE, TECHNOLOGY, SOCIETY(HM 216)



COURSE OBJECTIVES

- WILL BEGIN BY ASKING QUESTIONS SUCH AS
- “WHAT IS SCIENCE? WHAT IS TECHNOLOGY?
- HOW ARE THEY RELATED?
- WHEN HAVE SOCIETIES FELT THE NEED TO DISCUSS AND DEBATE THE RELATIONS BETWEEN SCIENCE, TECHNOLOGY AND SOCIETY?
- WHY SHOULD WE CARE?

INTERDISCIPLINARITY

- TO ANSWER THOSE QUESTIONS WE WILL HAVE TO TAKE THE HELP OF A RANGE OF HUMANITIES AND SOCIAL SCIENCE DISCIPLINES LIKE:
- PHILOSOPHY, HISTORY, SOCIOLOGY, ANTHROPOLOGY
- WHAT KIND OF QUESTIONS DO THESE DISCIPLINES ASK? WHAT ARE THERE CONCERNS?

CRITICAL THINKING

- AT THE HEART OF ALL THESE DISCIPLINES IS THE EXERCISE OF CRITICAL THINKING.
- WHAT IS CRITICAL THINKING? AND WHY IS IT SO IMPORTANT IN OUR TIMES?
- AT ITS BASIC DEFINITION CRITICAL THINKING IS THE OBJECTIVE ANALYSIS OF AN ISSUE IN ORDER TO FORM A JUDGEMENT.

THE ORGINS OF CRITICAL THINKING

- THE GREEK PHILOSOPHER SOCRATES, 470-399 BC

SOCRATES SET THE AGENDA FOR CRITICAL THINKING BY URGING HIS DISCIPLES TO QUESTION COMMON BELIEFS, TO UNDERSTAND THE VESTED INTEREST OPERATING BEHIND BELIEFS THAT ARE UNREASONABLE OR ILLOGICAL. ENCOURAGED, REFLECTION, AND THE EXERCISE OF LOGIC AND REASON OF OBSERVATION AND EVIDENCE.

WHY IS CRITICAL THINKING CENTRAL TO HM 216?

- THIS IS A COURSE THAT WILL ENCOURAGE TO CONFRONT UNORTHODOX VIEWS OF SCIENCE AND TECHNOLOGY.
- THIS IS NOT TO SAY THAT THIS COURSE IS ANTI-SCIENCE OR ANTI-TECHNOLOGY
- IT MERELY PUSHES YOU TO ASK WHAT SCIENCE, WHAT TECHNOLOGY DO WE NEED AND WHY? WHO DECIDES?

THE ORIGINS OF STS

- THE BEGINNINGS GO BACK TO THE HISTORICAL PERIOD SOON AFTER THE FIRST WORLD WAR (JULY 1914-NOV 1918)
- FOUGHT BETWEEN **ALLIED POWERS** REPRESENTED BY BRITAIN,FRANCE,RUSSIA, UNITED STATES - AND THE CENTRAL POWERS LED BY GERMANY, AUSTRIA-HUNGARY,THE TURKISH OTTOMAN EMPIRE

CONSEQUENCES OF THE GREAT WAR

- 9 MILLION COMBATANTS, 7 MILLION CIVILIANS DEAD- SEVERAL WOUNDED AND MAIMED FOR LIFE- ENORMOUS DESTRUCTION OF PROPERTY
- ALL THE RESULT OF THE USE OF MASSIVE AND NEW TECHNOLOGIES OF WAR- NEW FORMS OF CHEMICAL WARFARE . IN OTHER WORDS THE WAR SAW THE MASSIVE DEPLOYMENT OF S AND T

RE-THINKING THE IMAGE OF SCIENCE

- FROM THE BEGINNINGS OF MODERN SCIENCE IN THE 17TH CENTURY UP TO THE EARLY 20TH CENTURY- SCIENCE ENJOYED A POSITIVE IMAGE.
- WAS LOOKED UPON AS A FORCE OF PROGRESS AND PROSPERTIY- OF THE HIGHEST FORM OF HUMAN CREATIVITY, OF THE SINGLE GREATEST SOURCE OF SUSTAINED SURVIVAL OF HUMANKIND

NEW ASSESSMENTS OF SCIENCE AND TECHNOLOGY

- SCIENCE AND TECHNOLOGY WERE NOT UNQUALIFIED PROGRESSIVE FORCES- THEY COULD ENSURE THE PROGRESS AND PROSPERITY OF HUMAN KIND- BUT ALSO DESTROY IT.
- CRITIQUES OF MODERN SCIENCE DURING THIS PERIOD BEGAN WITH CRITIQUES OF WARFARE AND ITS DESTRUCTIVE CONSEQUENCES- WHILE STATES DEPLOYED MORE AND MORE SC AND TECHNOLOGY IN WARFARE, SOME SCIENTISTS BEGAN TO QUESTION IT.

2 QUESTIONS

- SCIENCE FOR HUMAN WELFARE OR SCIENCE FOR WARFARE?
- MARXIST WRITERS LIKE THE SCIENTIST J.D. BERNAL MADE THE DISTINCTION BETWEEN BOURGEOIS OR CAPITALIST SCIENCE AND SOCIALIST SCIENCE
- CAPITALIST SCIENCE- SCIENTIFIC KNOWLEDGE THAT WAS TIED TO THE IDEOLOGY OF A CAPITALIST SOCIETY- PROFIT SEEKING

BERNAL- SOCIAL FUNCTION OF SCIENCE 1939

- **SOCIALIST SCIENCE – SCIENCE AND TECHNOLOGY TIED TO THE IDEOLOGY OF PUBLIC GOOD AND WELFARE.**
- **ARGUMENT-** THIS WAS AN ARGUMENT NOT AGAINST SCIENCE BUT AN ARGUMENT FOR MORE SCIENCE IN SOCIETY- OR RATHER MORE SYSTEMATIC APPLICATIONS OF SCIENTIFIC THINKING ON ALL ASPECTS OF SOCIAL LIFE.

TO MAKE SCIENCE SERVE HUMAN PROGRESS- REAFFIRM ITS METHOD

- PHILOSOPHERS OF SCIENCE ARGUED THAT IF INDEED SCIENCE HAD TO SERVE THE PURPOSE OF HUMAN PROGRESS AND WELFARE IT HAD TO CONSTANTLY REAFFIRM ITS PRIMACY AS THE MOST VALID FORM OF HUMAN KNOWLEDGE – OVER ABOVE OTHER DOMAINS OF HUMAN KNOWLEDGE AND THOUGHT.
- THIS COULD BE DONE BY RE-ASSERTING THE SUPERIOR METHODS OF SCIENTIFIC KNOWLEDGE MAKING AND EVALUATING ITS TRUTHS.

INTER WAR CRITICISMS OF SCIENCE

- THE 2 KINDS OF CRITICISM OF SCIENCE DURING THE INTER-WAR PERIOD THUS CAME FROM 2 SOURCES
- FIRST, PHILOSOPHERS, WHO FOCUSSED ON THE METHODS OF SCIENCE
- SECOND MARX INSPIRED SCIENTISTS WHO ASSERTED THE SOCIAL FUNCTION OF SCIENCE.

THE SECOND WORLD WAR AND MORE QUESTIONS ABOUT S AND T

- EVEN MORE DEVASTATING IN ITS CONSEQUENCES THAN THE FIRST WORLD WAR. REGARDED AS THE DEADLIEST CONFLICT IN HUMAN HISTORY. FOUGHT BETWEEN 1939 AND 1945
- THE ALLIED POWERS – SOVIET UNION, BRITAIN, USA, CHINA
- AXIS- GERMANY, ITALY, JAPAN

HUMAN FATALITIES

- APPROXIMATELY 50-85 MILLION DEATHS
- MILLIONS OF CASUALTIES
- SAW 2 MAJOR EPISODES OF COLLECTIVE DESTRUCTION OF HUMAN LIVES
- THE HOLOCAUST IN NAZI GERMANY-KILLING 11 M JEWS
- THE DROPPING OF THE ATOM BOMB IN HIROSHIMA AND NAGASAKI IN AUG 1945 KILLING 50 M CIVILIANS

ROLE OF SCIENCE AND TECHNOLOGY

- NEW AND DEADLY WEAPONS OF WAR- ROCKETS, ANTI-AIRCRAFT WEAPONRY, SUBMARINES, CRUISE MISSILES, BALLISTIC MISSILES, AND MORE IMPORTANTLY THE HYDROGEN BOMB.
- MASSIVE USE OF CHEMICAL AND BIOLOGICAL WARFARE. DEATHS ALSO INDUCED BY STARVATION AND DISEASE.

2 QUESTIONS AGAIN-WHAT WAS GOING WRONG WITH SCIENCE?

**WAS SCIENCE GOING WRONG BECAUSE IT
WASN'T FOLLOWING THE RIGHT METHODS?**

OR

**WAS SCIENCE GOING WRONG BECAUSE
SCIENTISTS HAD LOST THEIR MORAL VALUES?**

METHOD AND MORALITY

- BOTH QUESTIONS ABOUT SCIENCE'S METHOD AND MORALITY WERE BASED ON AN IDEALISTIC UNDERSTANDING OF SCIENCE THAT DEVELOPED FROM THE 17TH CENTURY AND FOUND ITS FULL FLOWERING IN THE PERIOD OF THE ENLIGHTENMENT.
- THIS WAS A POWERFUL, INFLUENTIAL AND DOMINANT VIEW OF SCIENCE THAT WAS WHOLLY ROOTED IN AN IDEALIST FRAMEWORK.

THE POST-WAR DEBATES ON SCIENCE UPTO 1962

- THE FOREMOST POST-WAR DEBATES IN THE IDEALIST TRADITION CAME FROM THE LATE 1950S.
- PHILOSOPHERS ONCE AGAIN ASSERTED THE SANCTITY AND UNIQUENESS OF THE SCIENTIFIC METHOD AND BELIEVED THAT SCIENCE IF FOLLOWED IN ACCORDANCE WITH ITS METHODS COULD DO NO HARM TO HUMANKIND.
- THE METHODS OF SCIENCE WERE ABOUT METHODS OF FINDING TRUTH – AND SCIENCE ACCORDING TO THESE PHILOSOPHERS HAD THE BEST WAYS OF APPROXIMATING TRUTH- -

RETURN TO QUESTIONS OF WHAT CONSTITUTES SCIENTIFIC METHOD

- WHY IS IT NECESSARY TO RETURN TO THE QUESTION OF THE SCIENTIFIC METHOD- I.E THE TERMS OF ITS KNOWLEDGE-MAKING AND THE TERMS OF ITS EVALUATION OF TRUTH?
- BECAUSE IT WAS ALMOST TAKEN FOR GRANTED THAT BECAUSE SCIENCE WAS A RULE BOUND, FORMAL WAY OF ACQUIRING KNOWLEDGE IT WAS LESS LIKELY TO BE CORRUPTED BY HUMAN FLAWS AND VICES.

SCIENCE AND THE METHOD OF LOGICAL POSITIVISM

**THE VIENNA SCHOOL -1930S SCIENTIFIC
TRUTHS BASED ON POSITIVE OR VERIFIABLE
KNOWLEDGE ACQUIRED THROUGH
OBSERVATION AND EXPERIENCE AND
LOGICALLY PUT TOGETHER AS FORMALIZED
KNOWLEDGE.**

**THE TASK OF THE SCIENTIST WAS TO FIND
BETTER AND BETTER METHODS OF
VERIFYING KNOWLEDGE**

LOGICAL POSTIVISTS VS KARL POPPER

- EVEN THOUGH THE VIEW OF THE LOGICAL POSTIVISTS WAS DEEPLY INFLUENTIAL AND HELD SWAY FOR OVER TWO DECADES IN THE LATE 1950S THEIR VIEW WAS CHALLENGED BY THE AUSTRIAN PHILOSOPHER KARL POPPER. BOOK – THE LOGIC OF SCIENTIFIC DISCOVERY FIRST PUBLISHED IN GERMAN IN 1934 AND THEN IN ENGLISH IN 1959.
- POPPER HAD IMMENSE FAITH IN SCIENCE AND BELIEVED THAT SCIENTISTS MUST ASSERT THEIR METHODS OF KNOWING AND DRAW BOUNDARIES BETWEEN THEM AND THOSE WHO INDULGED IN OTHER KINDS OF KNOWLEDGE-MAKING THAT DID NOT FOLLOW STRICT RULES OR METHODS.

VERIFICATIONISM VS FALSIFICATIONISM

- BUT UNLIKE THE VIENNA CIRCLE WHO ARGUED FOR INDUCTIVE REASONING AND VERIFICATION PRINCIPLE AS THE BASIS OF SCIENTIFIC METHOD, KARL POPPER ARGUED THAT TRUE SCIENTISTS APPROXIMATED TRUTHS BY WAY OF ALLOWING THEIR THEORIES TO BE FALSIFIED RATHER THAN VERIFIED. ANY THEORY CAN POTENTIALLY BE FALSIFIED BY ANOTHER ONLY IF BOTH FOLLOWS THE SAME RULES.
- A SCIENTIFIC THEORY THAT COULD WITHSTAND THE CHALLENGE OF FALSIFICATION COULD BE DEEMED TO BE NEARING APPROXIMATIONS OF TRUTH.

EFFECT OF KARL POPPER'S INTERVENTION

- THE NET EFFECT OF KARL POPPER'S INTERVENTION IN THE DEBATES ON THE SCIENTIFIC METHOD WAS THAT EVEN WHILE HE CRITICIZED THE OLDER THEORIES OF THE VIENNA CIRCLE, HE WAS LIKE THEM AN IDEALIST WHO BELIEVED THAT THE METHODS OF SCIENCE AND THE WAYS OF MAKING SCIENTIFIC KNOWLEDGE WERE UNIQUE AND SUPERIOR TO ANY OTHER WAY OF KNOWING AND INTERPRETING THE WORLD.

THE CHALLENGE TO THE IDEALISTS

- THE CHALLENGE TO THE IDEALISTS OF THE SCIENTIFIC METHOD IE BOTH THE LOGICAL POSTIVISTS AS WELL AS KARL POPPER CAME FROM 2 QUARTERS.
- ONE FROM A POLISH –JEWISH MICROBIOLOGIST NAMES LUDWIK FLECK WHO WROTE A BOOK IN 1935 TITLED THE RE-DISCOVER OF THE WORK OF LUDWIG FLECK (1935) “GENESIS AND DEVELOPMENT OF A SCIENTIFIC FACT.”
- AND SECOND THE PUBLICATION OF THOMAS KUHN’S THE STRUCTURE OF SCIENTIFIC REVOLUTIONS. (1962)

FROM THE IDEALIST TO THE REALIST PERSPECTIVES OF SCIENTIFIC METHOD

- BOTH FLECK IN 1935 AND KUHN MUCH LATER IN 1962 ARGUED THAT IF ONE HAD TO UNDERSTAND THE SCIENTIFIC METHOD ONE HAD TO STUDY HOW SCIENTISTS ACTUALLY WORKED IN A LABORATORY.
- HOW WERE SCIENTIFIC FACTS ACTUALLY MADE?
- HOW WERE SCIENTIFIC TRUTHS ARRIVED AT? BY STRICT FOLLOWING OF METHODS OR BY SOCIAL CONSENSUS?

THE BIRTH OF STS

- IT IS THIS MOVE FROM UNDERSTANDING SCIENCE AND SCIENTISTS FROM THE EARLIER IDEALIST MODE TO THE LATER REALIST MODE THAT ALLOWED THE EMERGENCE OF A DISCIPLINARY FIELD LIKE STS?
- THE QUESTION IS WHAT EXACTLY WAS THOMAS KUHN'S ROLE IN MAKING STS POSSIBLE?