10-60
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App 3-1-11
Senate Info -3/22/11

Undergraduate Distance Education Review Form (Revised 2/28/11)

(Required for all courses taught by distance education for more than one-third of teaching contact hours.)

Existing and Special Topics Course

Course: LBST 499 – The Atomic Bomb and its Impact

Instructor(s) of Record: Dr. M. Numan, Mr. R. Freda, Dr. S Sobolewski, and Dr. V. Wijekumar

Phone: 724-357-2370 **Email:** mznuman@iup.edu, ronfreda@iup.edu, sobolews@iup.edu, and vjwije@iup.edu

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Step One: Proposer

A. Provide a brief narrative rationale for each of the items, A1- A5.

1. How is/are the instructor(s) qualified in the distance education delivery method as well as the discipline?

All the instructors listed above have taught several online courses over the years. These include introductory and advanced physics courses, dual level physics courses and a science online course. All the instructors have used the WebCT for teaching online courses and attended Moodle workshop. Two instructors (Sobolewski, Wijekumar) have used the Moodle for course communication and management.

All the instructors are approved to teach and have taught the LBST course in traditional setting.

2. How will each objective in the course be met using distance education technologies?

Course Objectives: After successfully completing the course, the student will be able to

a. summarize the scientific, military, and political issues related to the development of the atomic bomb.
b. outline the physical, social, political, and philosophical consequences of the decision to drop the bomb.
c. compare and combine various disciplinary perspectives on a common topic to arrive at a synthesized conclusion.
d. think critically, write cohesively, and make organized verbal presentations.

The course objectives (a) and (b) will be met in the following way:

The students will be assigned readings from the text book (The Making of the Atomic Bomb by Richard Rhodes) that present the making of the atomic bomb from the point of view of the scientists, military brass, and political leaders involved in the project. The students will view selected videos that are in the public domain, e. g., 20 min video interviews from the WGBH production of *War and Peace in the Nuclear Age* through the website: openvault.wgbh.org. [Registration (free) is required and personal and educational use is permitted by the terms and conditions of WGBH Media Library.] Furthermore, the supplemental lecture material provided on-line by the instructor covering the issues from more contemporary perspective would be available to them. Students will study the material and use the electronic journal and the short essays to demonstrate attainment of these objectives.

The objectives (c) and (d) will be met in the following way:

The group essay, synthesizing various disciplinary perspectives, will be written collaboratively in Moodle groups (and revised with on-line feedback from their peers and the instructor) to achieve objective (c). Furthermore, the required journal entries and oral presentations on relevant topics will allow them to demonstrate ability to synthesize diverse material in light of their disciplinary perspective. Short videos of

oral presentations will be posted for peer review. The Forum feature of the IUP Moodle will be used by the students to critique the posted essays and the oral presentations of fellow students to evaluate attainment of these objectives. The instructor will moderate and monitor the posts and guide them with these objectives in mind. We will explore the possibility of using 'Wimba classroom' software for synchronous interaction.

3. How will instructor-student and student-student, if applicable, interaction take place?

   Instructors and students will use IUP Moodle Forum site and Chatroom for communication. The students will be able to access their instructor through email for private communication. The group essay will require student-student interaction and collaboration, which will be set up within Moodle group feature. We will explore the use of Wimba to facilitate synchronous on-line interaction.

4. How will student achievement be evaluated?

   Student achievement will be evaluated on the quality of the short papers, the 10-minute video presentation of their oral presentation, journal entries, the collaborative paper, and the posted feedback on and from their fellow students.

5. How will academic honesty for tests and assignments be addressed?

   Papers will be checked using 'turnitin' for plagiarism. Students would be required to send a photo Identification card and these will be compared to the presenters in the video presentation.

B. Submit to the department or its curriculum committee the responses to items A1-A5, the current official syllabus of record, along with the instructor developed online version of the syllabus, and the sample lesson. This lesson should clearly demonstrate how the distance education instructional format adequately assists students to meet a course objective(s) using online or distance technology. It should relate to one concrete topic area indicated on the syllabus.

LBST 499 – The Atomic Bomb and Its Impact
(Syllabus of Record)

I. Course Description:

In terms that everyone can understand, we will explore the revolutionary new physics that predicted nuclear power, and we will follow the story of the scientific and technological miracle at Los Alamos where the first bomb was made. Then we will discuss the decision to drop the bomb on Hiroshima and Nagasaki and study the bombing's biological, social, and political consequences. We will also look at how literature was influenced by and influenced the atomic age.

II. Course Objective:

After successfully completing the course, the student will

a. be able to summarize the scientific, military, and political issues related to the development of the atomic bomb.
b. be able to outline the physical, social, political, and philosophical consequences of the decision to drop the bomb.
c. be able to compare and combine various disciplinary perspectives on a common topic to arrive at a synthesized conclusion.
d. be able to think critically, write cohesively, and make organized verbal presentations.

III. Course Outline

A. Introduction: A bird's eye view (1 week)

The goal of the synthesis course, its structure and dynamics, the responsibility of the students-individually and in assigned groups, and the role of the instructor vis-à-vis the students will be explained at the first meeting. A broad overview of the subject will be presented by showing film strips and video recordings selected from (i) decision of destiny, (ii) The Day after Trinity, or (iii) Dawn. A survey of students' background and interest will be conducted to suggest topics for short essays and to set up discussion groups.

B. The Making of the Atomic Bomb (6 weeks)

The following dimensions will be explored with various degree of emphasis based on the nature and composition of the class. Guest lecturers will be featured to bring in expert perspective. The documentary Plutonium Connection may be shown if appropriate.

1. Scientific and Technological Aspects

Discussions based on lecture at the level of Smyth (library reserve) and a packet of materials (see required reading list) available from Kinko's will give a clear background in the physics and engineering aspects of atomic energy.

2. Military and Administrative Perspective

The administrative problems of the formidable Manhattan Project, the questions of security

Step Two: Departmental/Dean Approval

Recommendation: ☑ Positive (The objectives of this course can be met via distance education)

☐ Negative

1-31-2011
Signature of Department Designee Date

Endorsed: 1-31-11
Signature of College Dean Date

Forward form and supporting materials to Liberal Studies Office for consideration by the University-wide Undergraduate Curriculum Committee. Dual-level courses also require review by the University-wide Graduate Committee for graduate-level section.

Step Three: University-wide Undergraduate Curriculum Committee Approval

Recommendation: ☑ Positive (The objectives of this course can be met via distance education)

☐ Negative

Gail Sechrist 3/1/11
Signature of Committee Co-Chair Date

Forward form and supporting materials to the Provost within 30 calendar days after received by committee.

Step Four: Provost Approval

☑ Approved as distance education course ☐ Rejected as distance education course

3/8/11
Signature of Provost Date

Forward form and supporting materials to Associate Provost.

and information exchange, managing the concentration of egos from universities and industry, containing messianic zeal and rampant pranksterism, and similar issues will be discussed on the basis of the interviews and written accounts of the major players (selected from Feynman, Groves, Baker, Badash, Hiebert, Brodie, and Sherwin).

3. Political and Diplomatic Issues

The decision making process regarding the atomic weapon, Anglo-American co-operation, approaches towards the Soviet Union and Japan, scientists as policy-makers – such issues will be addressed based on selected readings from Blackett, Sigal, Hiebert, Martin, Alperovist, and Herken.

4. Ethical Dimension

A selection of essays from various authors (Sherwin, Baker, Jungk, Fogelman, Smith) will be used to discuss the ethical concerns regarding the development and deployment of atomic power and weaponry.

C. Group Discussion of synthetic Essays (1 week)

D. Impact (4 weeks)

The following categories will be explored with varying degree of emphasis based on the audience. A guest lecturer will be featured contingent on availability.

1. Biological Effects

Discussion based on selections from Hiebert and 'Hiroshima & Nagasaki' concerning radiation effects and medical consequences of the bombing of Hiroshima and Nagasaki.

2. Political and strategic consequences

Discussion based on selections from Blackett, Brodie, Baker, Fogelman, and Herken.

3. Social Movements

Discussions based on selections from Baker, Smith and Hiebert.

4. Atomic Bomb in Literature

Students will read from the selections in the required reading list to discover the parallel between the historical development and its fictional counterpart, assess the mutual influence between science and science fiction, and critically appraise the attitude towards and the assumptions about the scientific enterprise in science fiction.

E. Group Discussion of Student Synthetic Essays (2 weeks)

IV: Evaluation Methods:

(1) Journal. Record lecture notes, reflections on reading, class discussions, and individual thoughts. To be collected periodically for grading and to make comments and suggestions. [15%],

(2) Class presentation. Oral reports on subtopics of students' choice using the perspective of their disciplinary major. Reports will be due at various points during the semester. [20%],

(3) Short Essays. Two or three brief (1 -2 pages) essays on reading assignments. Evaluation based on how well the material is used to answer questions posed by the assignments. [30%]

(4) A synthetic essay. Written in small groups, a 5-6 page draft essay synthesizing the group's collective thoughts will be due at mid-term for peer discussion and critique, moderated by the instructor. A final revised 8-10 page synthetic essay, based on group discussions and instructor's comments, will be due near the end of the term and evaluated based on peer evaluation, the degree of integration of multiple perspectives, use of evidence, logical development, and the quality of written prose. [35%].

V. Required Readings:

Textbook: "The Making of The Atomic Bomb" by Richard Rhodes
"The Bomb, *A Life*" by Gerard J. DeGroot. (Alternative)

Other readings (Xerox packets): Selected book chapters and articles prepared by the instructor. [Specific references deleted]

Typical Readings:

1) Feynman, *Surely You Are Joking, Mr. Feynman*; Anderson and Beason,
2) *The Trinity Paradox*; Smith, *Stallion Gate.*
3) Other selections from Rhodes, *The Making of the Atomic Bomb*; Fogelman, *Hiroshima: The Decision to Use the Bomb*; and *Hiroshima and Nagasaki--The Physical, Medical, and Social Effects of the Atomic Bombing.*
4) A world destroyed: Hiroshima and its legacies By Martin J. Sherwin, Edition 3, Published by Stanford Press, 2003.
5) Baxter, James P. *Scientists Against Time.* Boston: Little, Brown, 1946. 473 pp. (Reprinted 1968 by MIT Press)

VI. Special Resource Requirements:

[List of video cassettes and film strips deleted]

VII. Bibliography:

[Deleted]

LBST 499 -- The Atomic Bomb and Its Impact
(Distance Education Syllabus)

Summer Session I, 2011

Instructor: Dr. Muhammad Numan
Email: mznuman@iup.edu
Telephone: 724-357-2318

I. Catalog Description:

In terms that everyone can understand, we will explore the revolutionary new physics that predicted nuclear power, and we will follow the story of the scientific and technological miracle at Los Alamos where the first bomb was made. Then we will discuss the decision to drop the bomb on Hiroshima and Nagasaki and study the bombing's biological, social, and political consequences. We will also look at how literature was influenced by and influenced the atomic age. **Assignments:** (1) Electronic Journal for taking notes and recording thoughts [15%], (2) Video presentation of oral reports on subtopics of your choice using the perspective of your major [20%], (3) Short, informal essays on reading assignments with guided questions [30%], and (4) A synthetic group essay written collaboratively and revised based on on-line peer discussions and instructor's comments [35%]. **Typical Readings:** Feynman, *Surely You Are Joking, Mr. Feynman*; Anderson and Beason, *The Trinity Paradox*; Smith, *Stallion Gate*. Other selections from Rhodes, *The Making of the Atomic Bomb*; Fogelman, *Hiroshima: The Decision to Use the Bomb*; and *Hiroshima and Nagasaki--The Physical, Medical, and Social Effects of the Atomic Bombing*.

II. Course Objective:

After successfully completing the course, the student will be able to:

a. summarize the scientific, military, and political issues related to the development of the atomic bomb.
b. outline the physical, social, political, and philosophical consequences of the decision to drop the bomb.
c. compare and combine various disciplinary perspectives on a common topic to arrive at a synthesized conclusion.
d. think critically, write cohesively, and make organized verbal presentations.

III. Course Outline

A. Introduction: A bird's eye view (Unit 1)

The goal of the synthesis course, its structure and dynamics, the responsibility of the students-individually and in assigned groups, and the role of the instructor vis-à-vis the students will be explained in the first unit. Assigned viewing of film and video recordings from public domain similar to (i) decision of destiny, (ii) The Day after Trinity, or (iii) Dawn and selected websites will provide a broad overview of the subject. A survey of students' background and interest will be conducted on-line to suggest topics for short essays and to set up Moodle groups.

B. The Making of the Atomic Bomb (Units 2-7)

The following dimensions will be explored with various degree of emphasis based on the nature and composition of the class. Suitable videos will be assigned for viewing to present expert perspective – e.g., the documentary 'Plutonium Connection'.

1. Scientific and Technological Aspects

Discussions based on instructor notes at the level of Smyth and other assigned materials (see required reading list) will give a clear background in the physics and engineering aspects of atomic energy.

2. Military and Administrative Perspective

The administrative problems of the formidable Manhattan Project, the questions of security and information exchange, managing the concentration of egos from universities and industry, containing messianic zeal and rampant pranksterism, and similar issues will be discussed on the basis of selections from the interviews and written accounts of the major players (selected from Feynman, Groves, Baker, Badash, Hiebert, Brodie, and Sherwin).

3. Political and Diplomatic Issues

The decision making process regarding the atomic weapon, Anglo-American co-operation, approaches towards the Soviet Union and Japan, scientists as policy-makers – such issues will be addressed based on selections from Blackett, Sigal, Hiebert, Martin, Alperovist, and Herken.

4. Ethical Dimension

A selection of essays from various authors (Sherwin, Baker, Jungk, Fogelman, Smith) will be used to discuss the ethical concerns regarding the development and deployment of atomic power and weaponry.

C. Group Discussion of synthetic Essays (Unit 8)

The draft of group essays will be due and open for co-line peer critique through Moodle forum.

D. Impact (Units 9-12)

The following categories will be explored with varying degree of emphasis based on the audience. Selected videos will be assigned for viewing based on class dynamics.

1. Biological Effects

   Discussion based on selections from Hiebert and 'Hiroshima & Nagasaki' concerning radiation effects and medical consequences of the bombing of Hiroshima and Nagasaki.

2. Political and strategic consequences

   Discussion based on selections from Blackett, Brodie, Baker, Fogelman, and Herken.

3. Social Movements

   Discussions based on selections from Baker, Smith and Hiebert.

4. Atomic Bomb in Literature

   Students will read from the selections in the required reading list to discover the parallel between the historical development and its fictional counterpart, assess the mutual influence between science and science fiction, and critically appraise the attitude towards and the assumptions about the scientific enterprise in science fiction.

E. Group Discussion of Student Synthetic Essays (Units 13-14)
Final revised essays will be available for peer discussions and critique.

IV: Evaluation Methods:

(1) Journal. Maintain a journal to record summaries of assigned reading and viewing materials, reflections on the material studied, forum discussions, and individual thoughts. To be graded based on the quality of the entries. [15%],

(2) Class presentation. Video presentation (~ 10 min) of oral reports on instructor approved topics of students' choice using the perspective of their disciplinary major. Reports will be due at two points during the semester. [20%],

(3) Short Essays. Two or three brief (1 -2 pages) essays on reading assignments and guided questions. Evaluation based on how well the material is used to answer questions posed by the assignments. [30%]

(4) A synthetic essay. Written in small Moodle groups, a 5-6 page draft essay synthesizing the group's collective thoughts will be due at mid-term for peer discussion and critique, moderated by the instructor. A final revised 8-10 page synthetic essay, based on group discussions and instructor's comments, will be due near the end of the term and evaluated based on peer evaluation, the degree of integration of multiple perspectives, use of evidence, logical development, and the quality of written prose. [35%].

V. Required Readings:

Textbook: "The Bomb, *A Life*" by Gerard J. DeGroot.

Typical Readings:

1) Feynman, *Surely You Are Joking, Mr. Feynman*; Anderson and Beason,
2) *The Trinity Paradox*; Smith, *Stallion Gate*.
3) Other selections from Rhodes, *The Making of the Atomic Bomb*; Fogelman, *Hiroshima: The Decision to Use the Bomb*; and *Hiroshima and Nagasaki--The Physical, Medical, and Social Effects of the Atomic Bombing*.
4) A world destroyed: Hiroshima and its legacies By Martin J. Sherwin, Edition 3, Published by Stanford Press, 2003.
5) Baxter, James P. *Scientists Against Time.* Boston: Little, Brown, 1946. 473 pp. (Reprinted 1968 by MIT Press)

Technology requirement:

Windows 7, Vista, or XP; Mac OSX 10.4+

256 MB RAM

IE 7.0+, Safari 3.0+, Firefox 3.0+ (Browser must be Java and JavaScript enabled)

Internet access at 56k or above

A webcam for recording oral presentations.

Online References:

1. http://academic.udayton.edu/history/chapter13.htm
   Chapter 13 20th Century Science IV: Scientists Against Time: Science, Technology, WWII, and the Early Cold War
2. http://academic.udayton.edu/history/heitcv.htm
   Dr. Heitmann's History 340 Text Online. The Rise of Western Science: Ideas, Individuals, and Institutions
3. http://www.atomicbombmuseum.org/2_firstbombs.shtml (Little Boy and Fat Man – Bombs)
4. http://home.uchicago.edu/~mgugliel/guglielmo-war2.pdf (Contribution of Economists to military Intelligence during World War II by Mark Guglielmo, University of Chicago.
5. http://journals.cambridge.org/action/displayAbstract;jsessionid=E2F6B919386CCDF76EA8D921763E95D1.tomcat1?fromPage=online&aid=1740996 (online abstract of ref 4)
6. http://www.class.csupomona.edu/his/zwfiles/jeffj.doc (decision to drop the bomb)
7. http://www.rerf.or.jp/index_e.html (Radiation Effects Research Foundation)
8. http://www.rerf.or.jp/general/whatis_e/index.html (Rerf radiation def.)
9. http://library.thinkquest.org/18106/atomic.html (Dawn of the atomic age – dropping of the atomic bomb)
10. http://www.atomdays.com/part2/adp2.0.html (Manhattan project scientists)

11. http://www.atomicarchive.com/Docs/MED/med_chp22.shtml (radiation injuries of H & N)
12. http://www.atomicarchive.com/Docs/Hiroshima/index.shtml (Bombing of H & N)
13. http://www.southerncompany.com/learningpower/pdf/Introduction%20to%20Fission%20and%20Fusion.ppt (fission and fusion)
14. http://canteach.candu.org/library/20040731.pdf (fission in a reactor)
15. http://www.scribd.com/doc/4075430/Fission-and-Fusion
16. http://www.em.doe.gov/pdfs/EM%20Story%20brochure%20final%20final.pdf (EM story)
17. http://uit.no/getfile.php?PageId=2112&FileId=265 (Nucl. Weapon's medical effects)
18. http://www.physics.umd.edu/PhysPhun/PhPhPPT/The%20Nucleus.ppt (nucleus)
19. http://www.pptpalooza.net/PPTs/AHAP/AHAPStudentProjects/CharlesCandBenS-MotivesForDroppingAtomicBomb.ppt#68 (motives for dropping the bomb)
20. http://engineering.dartmouth.edu/courses/engs167/19%20Nuclear%20Medicine.pdf (nuclear medicine)
21. http://cfi.lbl.gov/~asitek/talks/Sitek_UVic04.pdf (nuclear medicine detail)
22. http://ceeducation.org/Documents/NucMed/Nuclear%20Medicine-2C.pdf (nucl. Med. Isotopes)
23. www.nuc.berkeley.edu/dept/Courses/NE-39/NE_39A_Lec_8-JV.**ppt** **(nucl. med. Berkeley)**
24. http://video.healthhaven.com/?keyword=nuclear+medicine+video&start=0&youtube=HmGa4I2lRsQ (nucl. Med video from Berkeley)
25. http://video.healthhaven.com/?keyword=nuclear+medicine+video&start=30&youtube=kxUdNUmeWLo (nucl. Med. Intro. Video)

LBST 499 -- The Atomic Bomb and Its Impact

Unit 09A (Impact – Biological)

1. Reading assignments:

a) From *The Bomb – A Life*, Ch. 6 Genshi Bakudon, pp. 82 -105
b) From *The Making of the Atomic Bomb*, Ch 19 Tongues of Fire, pp. 679 -714
c) Selected excerpts (to be posted with instructor's notes) from *Hiroshima and Nagasaki: The Physical, Medical, and Social Effects of the Atomic Bombings*
d) Power point presentation, Hiroshima and Nagasaki – The effects and the Debate (attached)

2. Journal Topics:

a) Summarize the Biological impact of the Heroshima Bombing.
b) Outline the psychological effect of the bombing on various groups.
c) Contrast the immediate reactions from the different parties involved.

3. Short essays:

Short essays from the material covered in this unit should be submitted by (date).

4. Additional references:

1. http://www.atomicarchive.com/Docs/MED/med_chp22.shtml (radiation injuries of H & N)
2. http://www.rerf.or.jp/general/whatis_e/index.html (Rerf radiation def.)
1. http://www.atomicarchive.com/Docs/Hiroshima/index.shtml (Bombing of H & N)

[Objectives addressed (b) outline the physical, social, philosophical consequences of the decision to drop the bomb. (c) compare and combine various perspectives on a topic. (d) think critically, write cohesively.]]

Hiroshima and Nagasaki

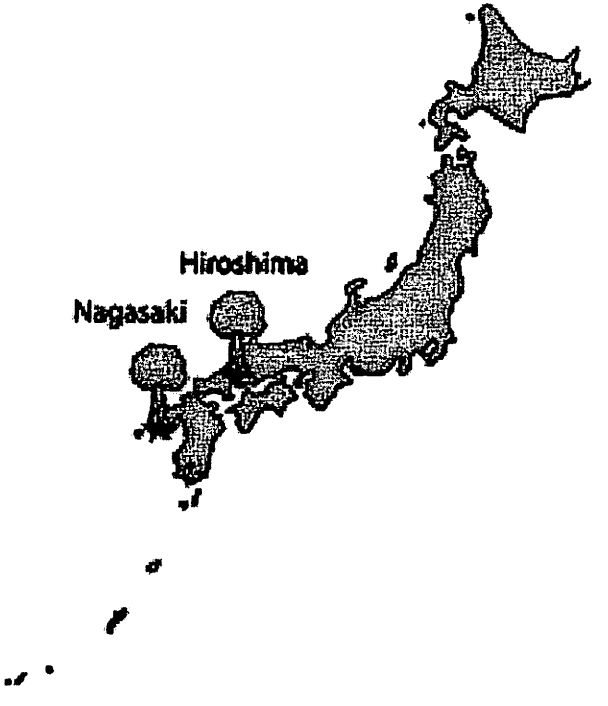
The Effects of the Atomic Bomb and the Debate

Note: This PowerPoint is largely based upon exhibits found at the Hiroshima Peace Memorial

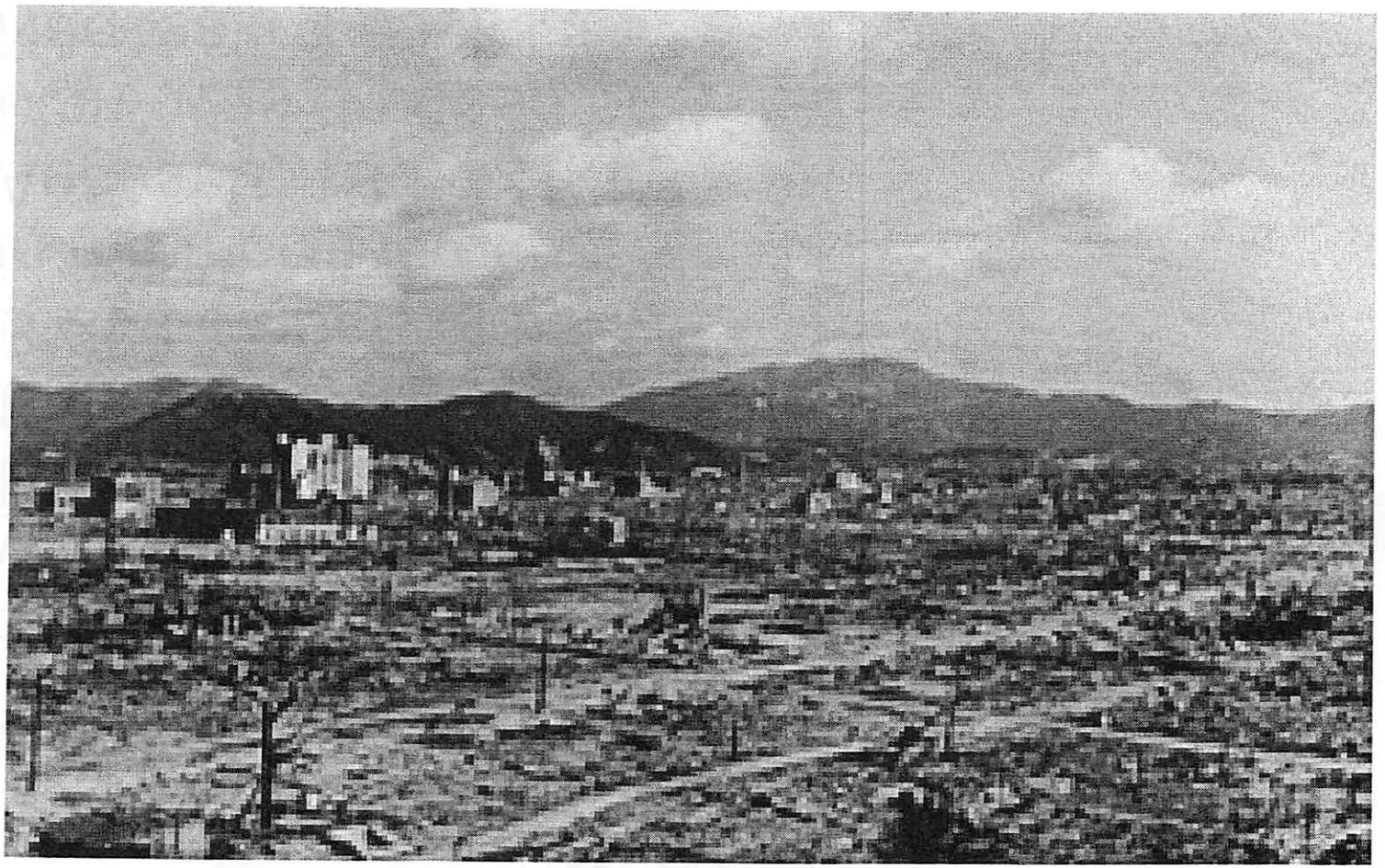
“My God, What Have We Done” John Lewis, Co-Pilot of the Enola Gay

Japan

- The atomic bomb named "Little Boy" was dropped on Hiroshima by the Enola Gay, a Boeing B-29 bomber, at 8:15 in the morning of August 6, 1945. “Fat Man” was dropped on Nagasaki 3 days later on August, 9, 1945.

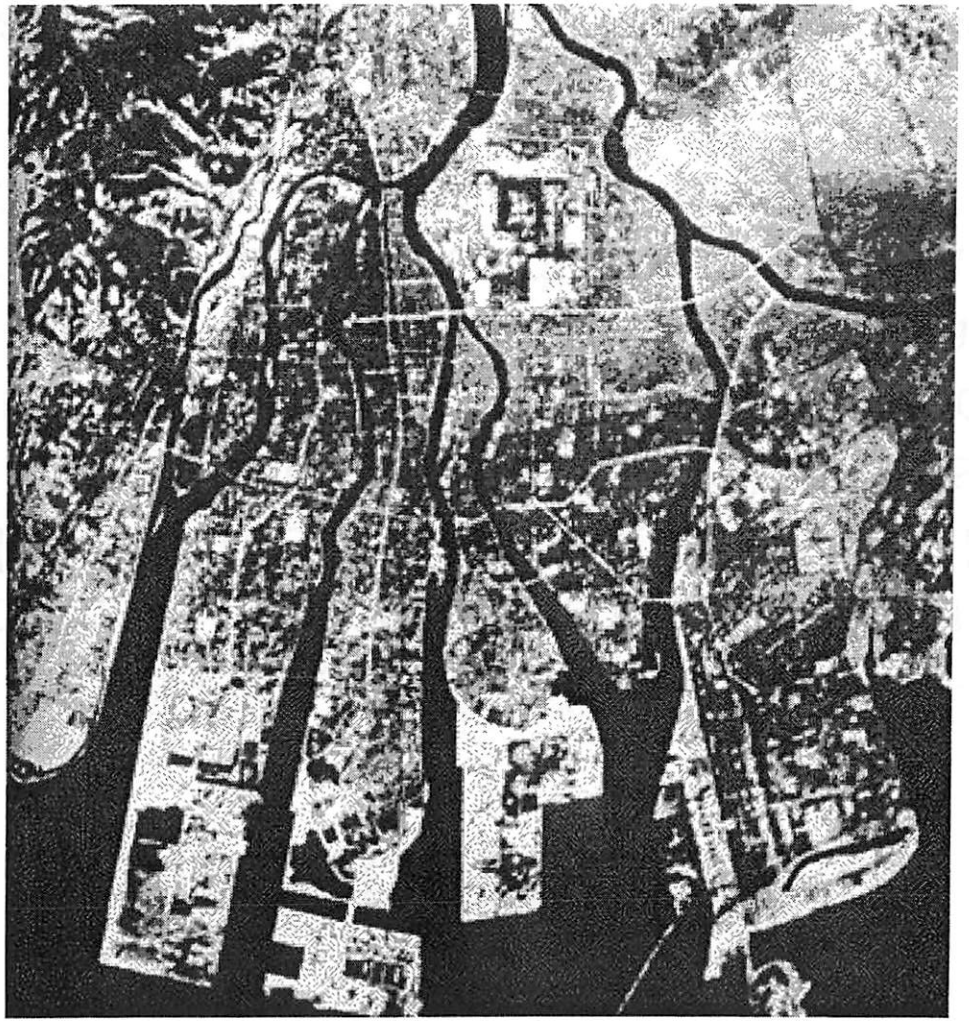


Panorama



http://www.pcf.city.hiroshima.jp/frame/Virtual_e/visit_e/estPanel_3.html

Hiroshima



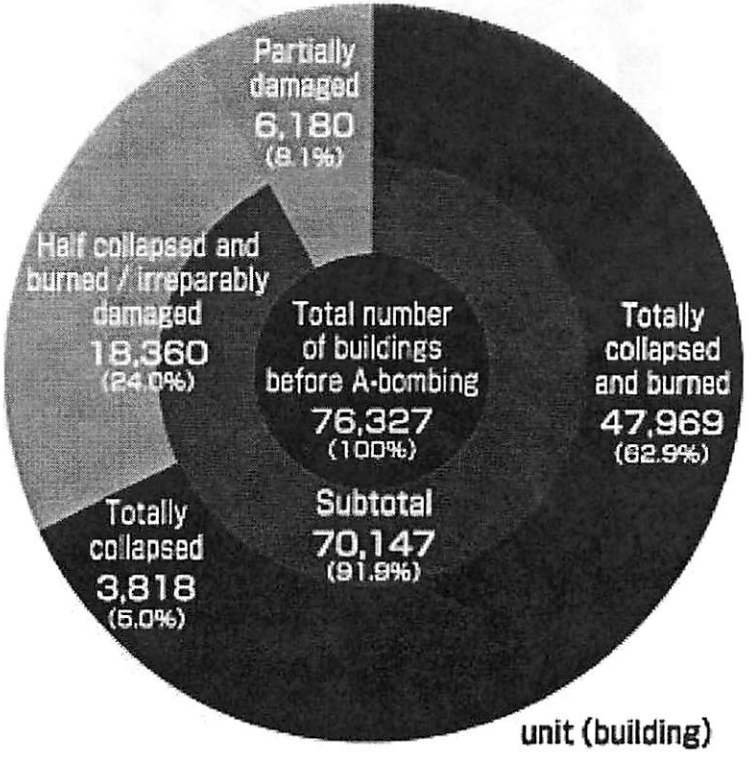
Hiroshima Blast

The bomb briefly flashed at a height of 580 meters and then erupted into an enormous fireball like the sun. More than a million degrees Celsius at its center, the fireball reached a maximum diameter of 280 meters in one second. Surface temperatures near the hypocenter rose to 3,000-4,000°C. Fierce heat rays and radiation burst out in every direction, expanding the air around the fireball and creating a super-high-pressure blast.

The Final death toll is believed to be around 140,000, mostly civilians. The clothes of the victims were burned by the heat. Bloodstained and in tatters, the survivors fled the devastated city.

Damage to Buildings

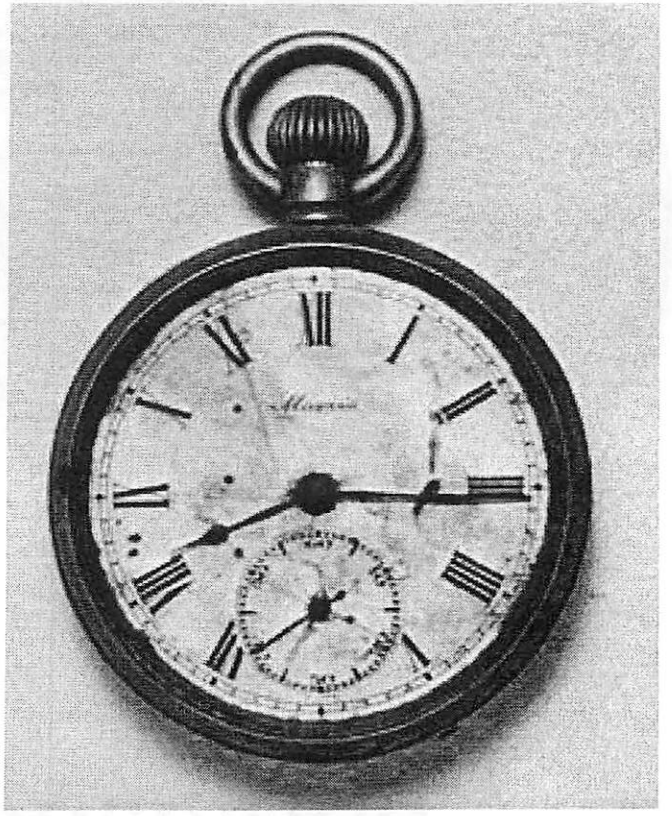
Eighty-five percent of Hiroshima's buildings were within three kilometers of where the atomic bomb exploded over the heart of the city. The damage extended to virtually the entire city, with 90 percent of all buildings burned or destroyed beyond repair.

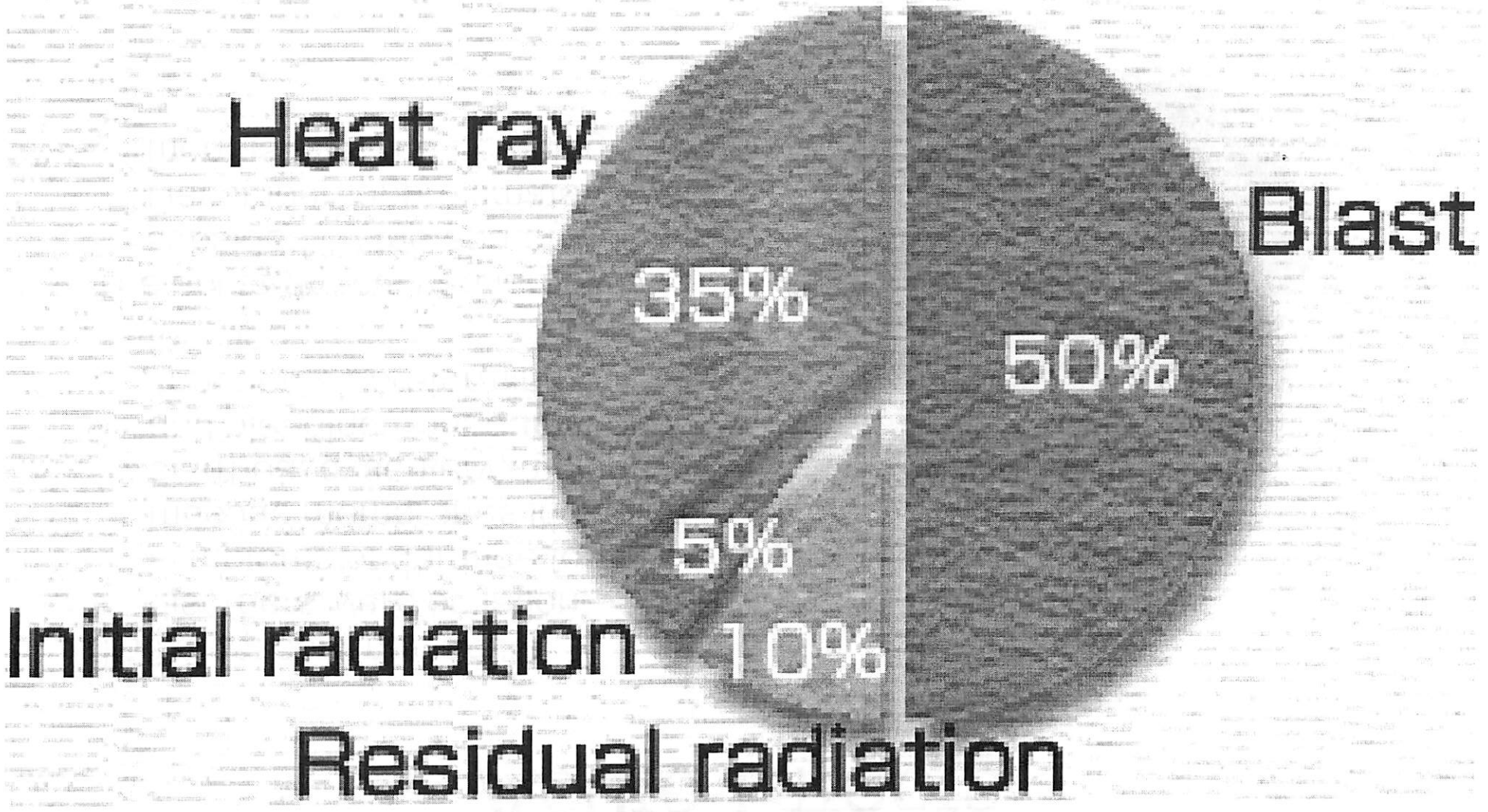


Pocket watch

1,600m from the hypocenter

Kengo Nikawa (then, 59) was exposed to the bomb crossing the Kan-on Bridge by bike going from his home to his assigned building demolition site in the center of the city. He suffered major burns on his right shoulder, back, and head and took refuge in Kochi-mura Saiki-gun. He died on August 22. Kengo was never without this precious watch given him by his son, Kazuo.




Heat ray
35%
Blast
50%
5%
Initial radiation
10%
Residual radiation

Acute Effects

- The most common acute disorders were epilation, symptoms of damage to mucous membranes including diarrhea, dysentery, melena and bleeding from gums, and impeded blood-forming functions.
- The acute effects had largely subsided by the end of December, approximately five months after the bombing.

Hair combed off of head in 3 strokes of a brush

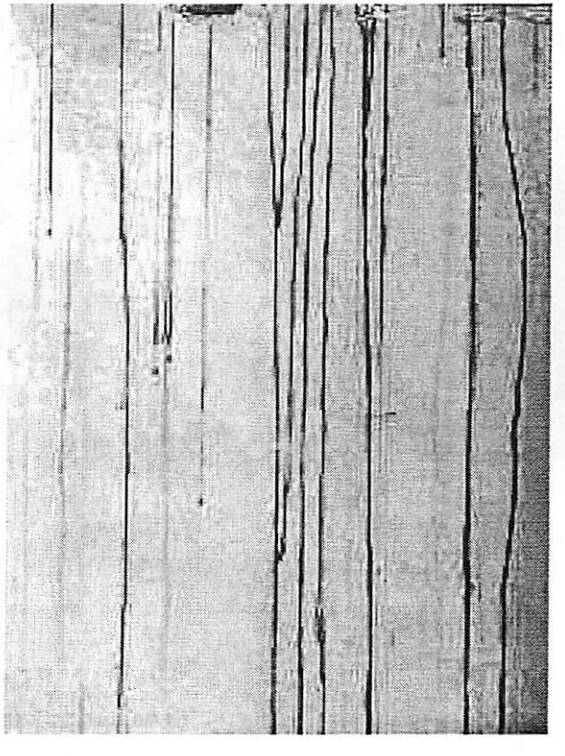
Radiation

- The defining characteristic of an atomic bomb that distinguishes it from any conventional bomb is radiation.
- Those exposed within about 1000 meters of the hypocenter received life-threatening doses, and most died within a few days.
- Decades later, that radiation was still producing harmful aftereffects. Leukemia and other cancers appeared over the course of 2 to 20 years, and radiation effects still threaten the health of the survivors.

Black Rain

Soon after the explosion, a giant mushroom cloud billowed upward, carrying dirt, dust, and other debris high into the air. After the explosion, soot generated by the conflagration was carried by hot air high into the sky. this dust and soot became radioactive, mixed with water vapor in the air, then fell back to earth in what came to be called "black rain."

The black rain contained radioactive material. Fish died and floated to the surface in the ponds and rivers where this rain fell. Many of the people who drank from wells in areas where the black rain fell suffered from diarrhea for three months.



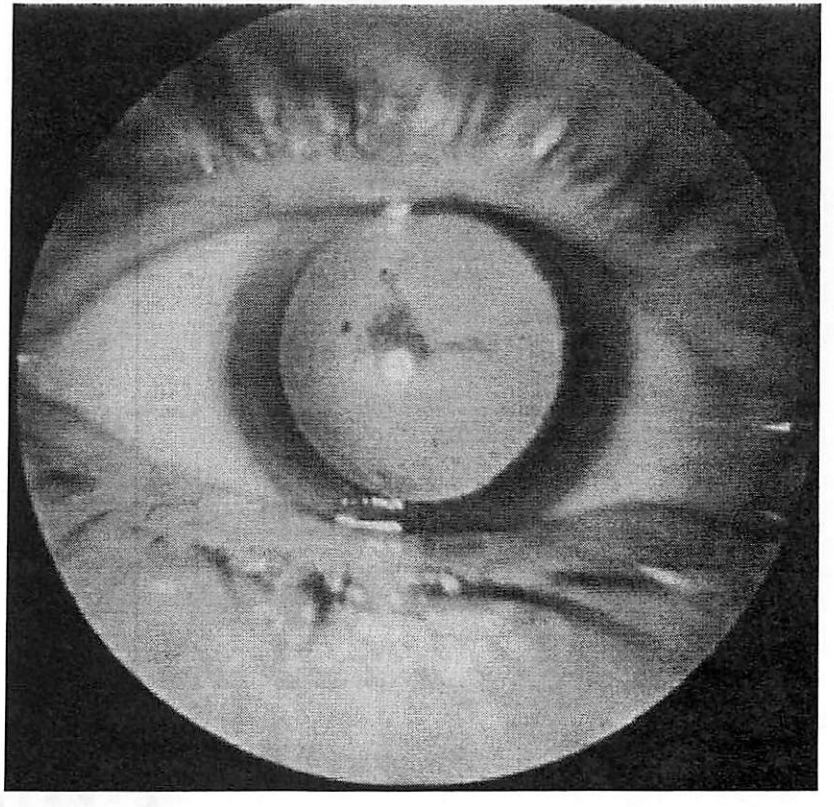
Keloids

Scars left by exposure to heat and radiation erupted 2-3 years after the blast

Cataracts

The patient was exposed 820m from the hypocenter and had white cloudiness in both eyes. The dark area in the center of this photo is the cloudiness caused by an A-bomb cataract.

Cataracts occurred several months to several years after exposure.



Leukemia and Cancer

Leukemia is cancer of the blood. The white blood cells multiply wildly without fully maturing. Red blood cells and platelets are reduced, leading to anemia. The white blood cells increase in number but lose normal functioning, which lowers resistance to infection. The incidence of leukemia was greatest 7 to 8 years after the bombing. The younger the survivor was at the time of exposure, the earlier was the onset of leukemia.

Cancers began to increase about 1960. Some cancers for which a correspondence has been confirmed between distance from the incidence are: myeloma, ovary cancer, urinary tract cancer, breast cancer, colon cancer, lung cancer, esophagus cancer, stomach cancer

Birth Defects

Radiation harmed fetuses in various ways.

Some were stillborn.

Some children were born without obvious problems but had higher mortality rates, even those who lived past infancy.

Development tended to be slower than that of other children.

Some were born with abnormally small heads, a condition known as microcephaly.

Those who were exposed close to the hypocenter in early pregnancy were likely to display microcephaly accompanied by severe mental retardation that renders them unable to manage everyday life without assistance.

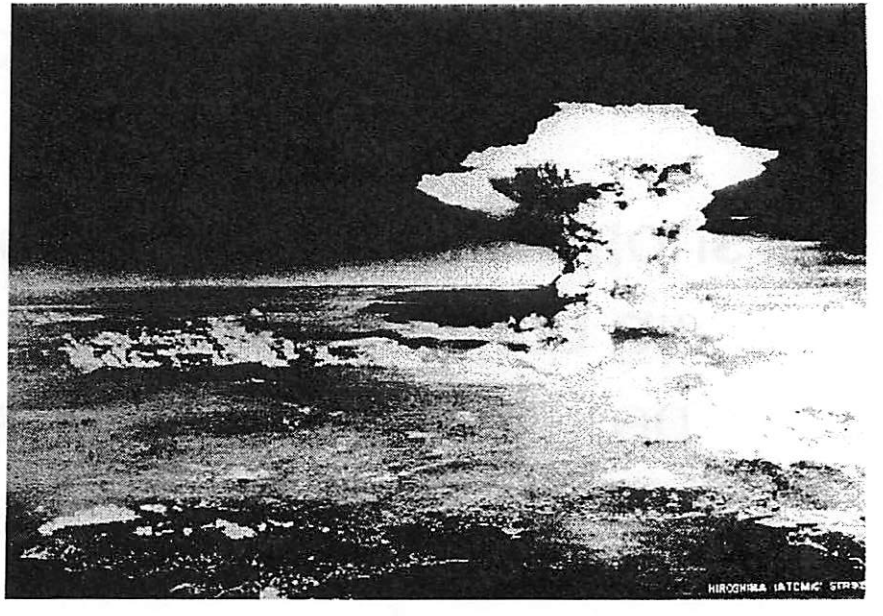
Blast

The atomic explosion created a super-high pressure at the epicenter of several hundred thousand atmospheres. The surrounding air expanded enormously, creating a tremendous blast.

All wooden houses were destroyed within a radius of two kilometers from the hypocenter. Even ferro-concrete structures were crushed by the power of the blast. Windows were smashed at a distance of sixteen kilometers.

The Blast Pressure

The wind velocity on the ground beneath the explosion center was 980 miles/hr, which is five times stronger than the wind generated by strong hurricanes



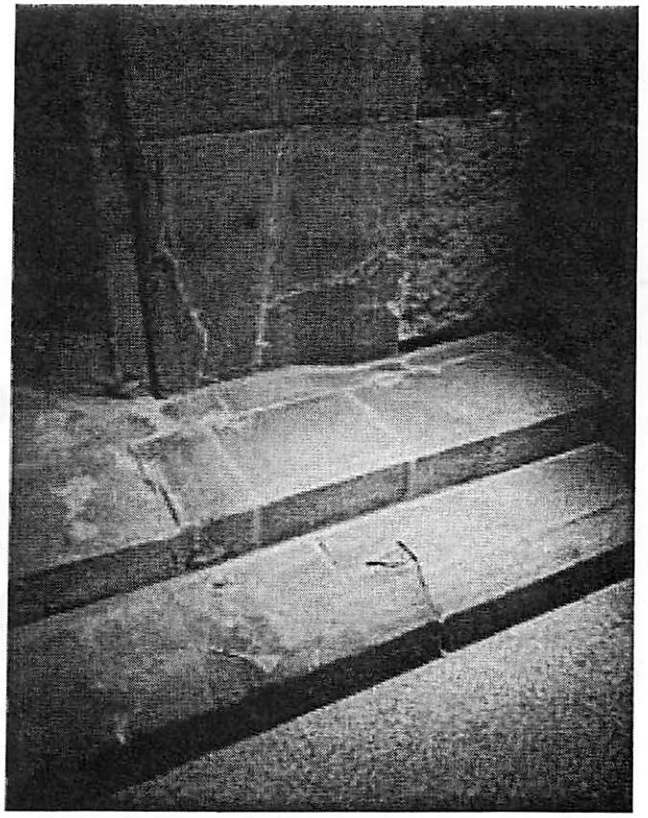
Heat

Within 0.3 seconds of detonation,
the fireball high in the air grew
to a diameter of more than 200 meters.
The temperature on the surface was 7,000
degrees C.

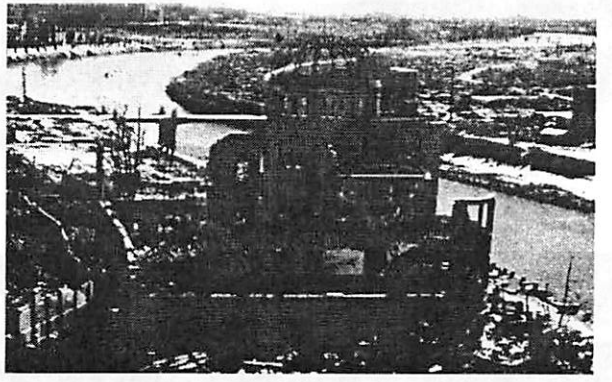
The heat rays released by that fireball
devastated the people and things below.

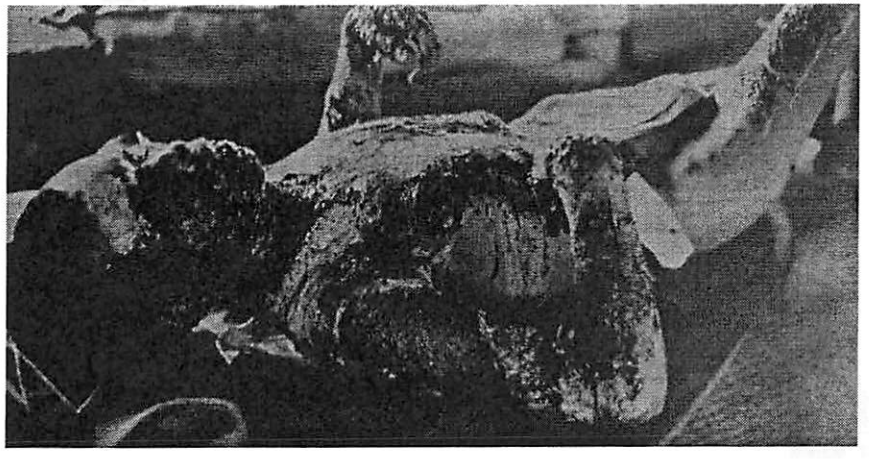
Human Shadow Etched in Stone

A person sitting on the bank steps waiting for it to open was exposed to the flash from the atomic bomb explosion. Receiving the rays directly from the front, the victim undoubtedly died on the spot from massive burns. The surface of the surrounding stone steps was turned whitish by the intense heat rays. The place where the person was sitting remained dark like a shadow



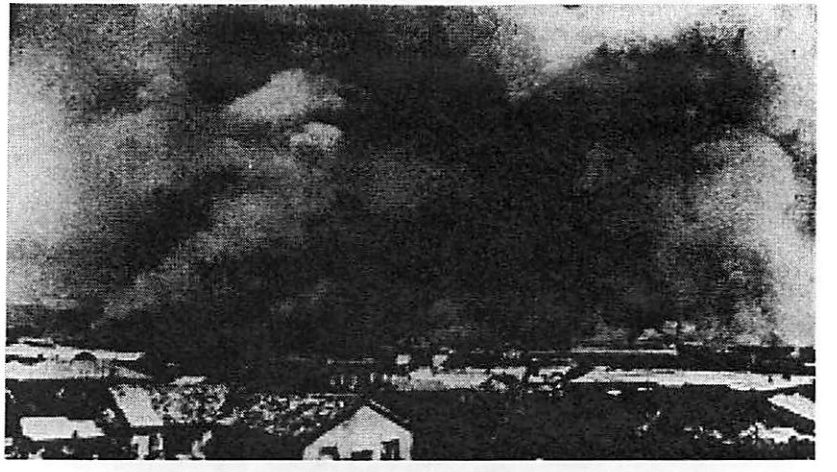
Pictures





Fire

When the atomic bomb detonated, houses at or near the hypocenter ignited all at once. Flames leapt up quickly throughout the city. For the next 3 days, the city burned. Within a radius of two kilometers, all combustible material was burned and the thousands of people trapped under collapsed buildings were burned to death.



Relief

- The atomic bomb instantaneously destroyed the Prefectural government offices, City Hall, the police stations, and all government buildings.
- The next day, the Army Marine Headquarters (commonly known as the Akatsuki Corps), which sustained only slight damage, took the lead in establishing the Hiroshima Security Regiment Headquarters.
- The military, the government, and the people united to carry out relief activities, often with little understanding of the effects of radiation.

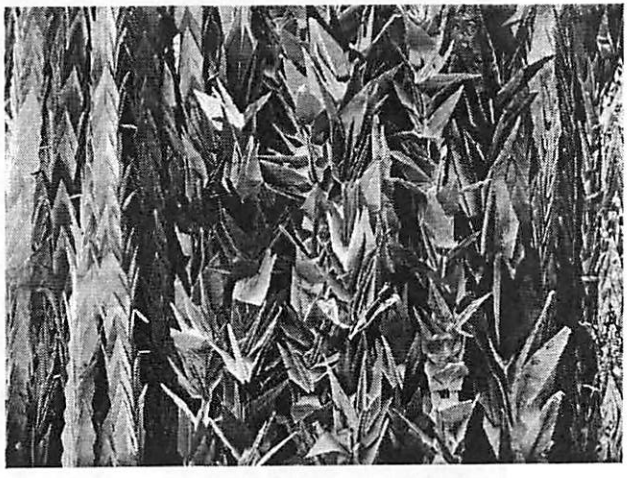
War orphans and Discrimination

Thousands of war orphans were created by the bomb.

Survivors of the bomb were victims of discrimination after the war. Known as Hibakusha, they found it difficult to find spouses to marry, get into good schools and colleges, and get hired for decent jobs. Listen at http://www.atomicarchive.com/Docs/Hibakusha_index.shtml

Sadako and the Thousand Cranes

- Sadako was a young, Japanese girl who was 2 years old when the bomb struck Hiroshima. At 11 years old, she developed Leukemia. In an effort to influence the gods to help her survive, she folded 1,000 paper cranes. She died at 12 years old.
- Sadako represents all of the children who died in Hiroshima, and the paper crane has become an international symbol of peace.



Hiroshima Today

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