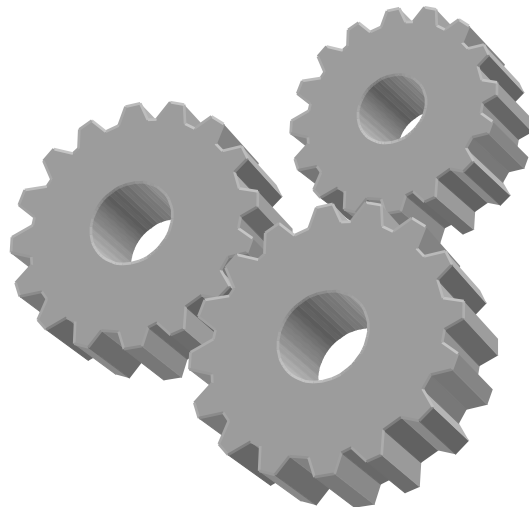


INTERNATIONAL AFRICAN INVENTORS MUSEUM

TEACHER'S PACKAGE

GRADES 11 – 12



By: Veronica Sullivan
2003

INTERNATIONAL AFRICAN INVENTORS MUSEUM

Teacher's Package

The International African Inventors Museum has developed an intriguing school program in keeping with the Ministry of Education's goal for **'teachers to work with the community to develop programs that help students to make connections among various technologies and among broad-based technology and real life experiences'**.

The exhibit presents the African Canadian Experiences that helped to shape the development of science and technology throughout the world. Students will learn about the key roles played by individuals to overcome their challenges and make an impact in their respective fields.

Teachers may wish to review the curriculum expectations for specific connections to their programs.

Overall the student will:

- **Understand basic concepts of science and technology;**
- **Demonstrate skills, strategies and habits of mind required for scientific inquiry and technological design; and**
- **Relate scientific and technological knowledge to each other and to the world outside the school**

Introduction to Field Trip

Have students begin to research specific technological developments and other important achievements of People of African descent. (e.g. African Canadians).

Pre Exhibit Activity

Included in your package is a **'Before the Exhibit'** worksheet to be filled out by students before viewing the exhibit. The worksheet is suitable for all grade levels.

The Exhibit

The **Student worksheets** provided are based on Ontario Ministry of Education expectations for Science and History for grades 7 – 12. You may select the ones suitable to your purpose. Please ensure that there are enough copies for each student attending the exhibit. Instruct students to be careful around the exhibits. Encourage the use of clipboards.

Assessment and Evaluation

The student **worksheet** compliments the self-guided time spent viewing the exhibit and will help to ensure that students are completing all elements and expectations of the assigned task.

You may wish to make observations of the student's commitment to task, willingness to examine exhibits carefully and completion of assigned task.

Follow up Activities

A student reflection worksheet entitled **'After the Tour'** is provided in your package. This should be filled out following your tour the exhibit.

- **Respond to the Exhibit**
- **Research projects in a variety of interdisciplinary areas**
- **Create an invention based on an exhibit**
- **Make a model of one of the inventions**
- **Discuss/Debate issues**

Teacher's Package
Grades 11-12
CURRICULUM CONNECTIONS

Ontario Ministry of Education Expectations Addressed by the Exhibit

Strand	Grade 11	Grade 12
Biology Academic & Applied	Internal Functions ~ Identify examples of technologies that have enhanced scientific understanding of internal systems. ~ Analyse ways in which societal needs have led to technological advances related to cellular processes. ~ Identify and describe Canadian contributions to technologies and techniques related to genetic processes. ~ Explain how scientific knowledge of cellular processes is used in technological applications ~ Describe and analyse examples of genetic technologies that were developed on the basis of scientific understanding. ~ Evaluate the impact of personal lifestyle decisions on the health of humans, and analyse how societal concern for maintaining human health has advanced the development of technologies related to the regulation of internal systems. ~ Explain the relevance of current studies of viruses and bacteria biotechnology.	Genetics ~ Describe some of the theoretical issues surrounding scientific research into genetic continuity; the general impact and philosophical implications of the knowledge gained; and some of the issues raised by related technological applications. ~ Investigate careers that involve knowledge of ecology or environmental technologies.
Chemistry	Matter ~ Describe how an understanding of matter and its properties can lead to the production of useful substances and new technologies.	Energy Changes & Rates of Reaction ~ Described examples of technologies that depend on exothermic or endothermic changes. Organic ~ Describe the variety and importance of organic compounds in our lives.
Earth and Space	~ Investigate challenges related to survival of humans in space.	~ Explain how the study of other planets and objects in the solar system has led to a better understanding of the earth. ~ Explain how the study of other planets and objects in the solar system has led to a better understanding of the Earth.
Physics	Forces and Motion ~ Evaluate and describe technological advances related to motion; and identify the effects of societal influences on transportation and safety issues. ~ Analyse ways in which an understanding of the dynamics of motion relates to the development and use of technological devices.	Energy ~ Analyse and describe the application of the concepts of energy and momentum to the design and development of a wide range of collision and impact - absorbing devices used in everyday life. ~ Analyse and describe, using the concepts and laws of energy and of momentum, practical applications of energy transformations and momentum conservation. ~ Analyse ways in which an understanding of the dynamics of motion relates to the development and use of technological devices, including terrestrial and space vehicles, and the enhancement of recreational activities and sports equipments.

Technological Education	Integrated Technologies ~ Demonstrate understanding of the principles of science underlying applications of technology in everyday life. ~ Evaluate the design and function of an everyday technology using identified criteria. ~ Describe the importance of contributions of Canadian scientists to the development of modern everyday technologies.	
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HISTORY CURRICULUM CONNECTIONS

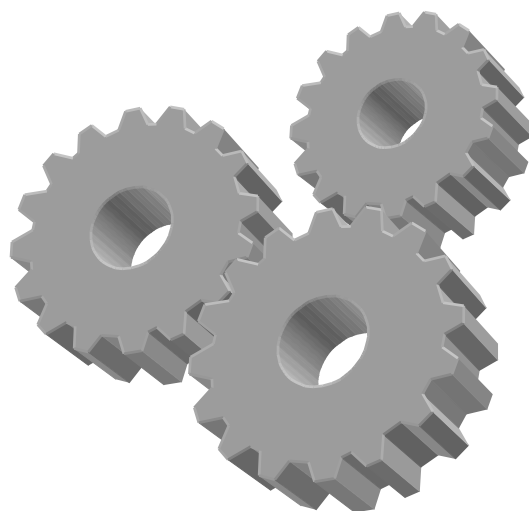
The basic goals of the Canadian and world studies program in Grades 11 and 12 are to ensure that students understand the relationship between technology and society and the factors contributing to society's continuous evolution.

Strand	Grade 11	Grade 12
Canada and the World Studies	<p>Continuity and Change</p> <ul style="list-style-type: none"> ~ Demonstrate an understanding of the effect on the development of American society and daily life of social and technological changes; ~ Effects of the closing of the frontier in 1898, of industrialization and urbanization after the Civil War, of the transformation from an industrial to a post-industrial economy) ~ Describe the roles played by key individuals in the process of change in American history (e.g., George Washington, Harriet Tubman). ~ Analyse the factors that contributed to the process of change from prehistory to the sixteenth century; ~ Demonstrate an understanding of the contributions of recently arrived and more established peoples and cultures to Canadian society ~ Describe key relationships and connections in the data studied (e.g., chronological ties, cause and effect, similarities and differences); <p><u>Methods of Historical Inquiry</u></p> <ul style="list-style-type: none"> ~ Critically analyse historical evidence, events, and interpretations; communicate ideas and opinions based on effective research clearly and concisely ~ Identify and describe relationships and connections in the data studied (e.g., chronological ties, cause and effect, similarities and differences) 	<p>Technology and Society</p> <ul style="list-style-type: none"> ~ Analyse the relationship between major social and technological changes in Canada; ~ Evaluate the social impact of new technologies (e.g. reproductive technologies) ~ Analyse the ways in which ecological knowledge resulting from advances in technology influences indigenous approaches to resource management and land tenure. ~ Analyse how changes in transportation and communications technology have influenced Canadian society and identity ~ Evaluate the extent to which technological and scientific innovations in the home (e.g., the introduction of electricity and electrical appliances) have affected Canadians' everyday lives and helped shape national identity. <p><u>Methods of Historical Inquiry</u></p> <ul style="list-style-type: none"> ~ Critically analyse historical evidence, events, and interpretations; communicate ideas and opinions based on effective research clearly and concisely ~ Identify and describe relationships and connections in the data studied (e.g., chronological ties, cause and effect, similarities and differences)

INTERNATIONAL AFRICAN INVENTORS MUSEUM

STUDENT WORKSHEETS

GRADES 11–12



**By: Veronica Sullivan
2003**

BEFORE YOU VIEW THE EXHIBIT

Name: _____
Grade: _____
Subject: _____

What you will need:

- Clipboard (Please do not lean against the exhibits to write)
- Pen /Pencil
- Student worksheet based on the purpose of your visit
- Extra writing paper

Please fill in this section at school or prior to entering the exhibit

What is the main purpose of your visit?

Do you know the names of any Black Scientists or Inventors?

Do you know of any inventions made by Black Inventors?

Do you know the names of any African Canadian Scientists or Inventors?

In which areas of Science do you expect to find the largest number of African Canadians?	In which areas of Science do you expect to find the largest number of Black Scientist and Inventors?

In which time periods (e.g. 1800's) do you expect to find the greatest number of achievements?

**YOU ARE NOW READY TO TOUR THE EXHIBIT.
 Check once more to ensure you have all that you need.
 !!!ENJOY DISCOVERING!!!**

Strand	Grade 11	Grade 12
Biology Academic & Applied	Internal Functions ~ Identify examples of technologies that have enhanced scientific understanding of internal systems. ~ Analyse ways in which societal needs have led to technological advances related to cellular processes. ~ Explain how scientific knowledge of cellular processes is used in technological applications ~ Describe and analyse examples of genetic technologies that were developed on the basis of scientific understanding ~ Explain the relevance of current studies of viruses and bacteria to the field of biotechnology.	Genetics ~ Describe some of the theoretical issues surrounding scientific research into genetic continuity; the general impact and philosophical implications of the knowledge gained; and some of the issues raised by related technological applications.

STUDENT WORKSHEET

Gr. 11 Identify inventions that required knowledge of internal systems.	Gr. 12 Find an exhibit that addresses an issue raised surrounding genetic continuity. Explain and describe the related technological application.
Invention: Inventor: Time Period: What knowledge of internal systems was required:	Name of exhibit: Time period: Issue raised:
Invention: Inventor: Time Period: What knowledge of internal systems was required:	Related Technological Application:
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Invention: Inventor: Time Period: What knowledge of internal systems was required:	Related Technological Application:

Suggested Exhibits

Queen Hashepsut Ernest Just Dr. Daniel Hale Williams Dr. Percy Julian	The Slave Trade Ernest Just Dr. Percy Julian M.D. (Recent museum additions to be included)
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Strand	Grade 11	Grade 12
Chemistry	Matter ~ Describe how an understanding of matter and its properties can lead to the production of useful substances and new technologies.	Energy Changes & Rates of Reaction ~ Describe examples of technologies that depend on exothermic or endothermic changes. Organic ~ Describe the variety and importance of organic compounds in our lives

STUDENT WORKSHEET

Gr.11 Find inventions that required an understanding of the properties of matter.	Gr.12 Find inventions that depend on exothermic or endothermic changes. Describe your examples.
Invention: Purpose of Invention: Inventor: Time Period: What substances were used in its production?	Invention: Description of Invention: Inventor: Time Period:
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Suggested Exhibits

All sections of the exhibit present information that compliments this strand.	Granville T. Woods Dr. James Andrew Harris Andrew F. Hilyer Nathaniel Minor (Recent museum additions to be included)	James D. Brownridge Norbert Rillieux Dr. Ken Effah Guarkro John T. Pride
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Strand	Grade 11	Grade 12
Earth and	~ Investigate challenges related to survival of	~ Explain how the study of other planets and objects in

Space	humans in space.	the solar system has led to a better understanding of the earth. ~ Explain how the study of other planets and objects in the solar system has led to a better understanding of the Earth.
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STUDENT WORKSHEET

<p>Gr.11 View the exhibit that focuses on Astronauts and Space related technologies. Select and Record the challenges addressed related to survival of humans in space.</p>	<p>Gr.12 Find discoveries /inventions based on an understanding of the solar system, the universe or outer space. Explain how it has led to a better understanding of the earth.</p>
<p>Brief History of Astronaut: Challenges faced:</p>	<p>Discovery/Invention: Description of Invention: How has this led to a better understanding of the earth? Inventor: Time Period:</p>
<p>Brief History of Astronaut: Challenges faced:</p>	<p>Discovery/Invention: Description of Invention: How has this led to a better understanding of the earth? Inventor: Time Period:</p>
<p>Description of Space Related Invention: Challenges addressed:</p>	<p>Discovery/Invention: Description of Invention: How has this led to a better understanding of the earth? Inventor: Time Period:</p>
<p>Choose one Astronaut or Space Related Invention for further investigation. State why you made this choice.</p>	<p>Choose one Invention or Discovery for further investigation. State why you made this choice.</p>

Suggested Exhibits

<p>Astronauts (Robert Lawrence, Ronald McNair, Dr. Mae Jemison, Col. Guion Bulford, Stephnie D. Wilson etc.) Peachy Booker Adolfphs Samms Hugh D. MacDonald Dr. Warren E Henry</p> <p>Maj. Federick D. Gregory Robert E. Shurney Christine Voncile Mann Darden</p>	<p>Egyptians Benjamin Banneker Peachy Booker Hugh D. MacDonald J. F. Pickering Dr. George Carruthers</p> <p>Robert E. Shurney</p>
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Strand	Grade 11	Grade 12
Physics	Forces and Motion	Energy

	<p>~ Evaluate and describe technological advances related to motion; and identify the effects of societal influences on transportation and safety issues. ~ Analyse ways in which an understanding of the dynamics of motion relates to the development and use of technological devices.</p>	<p>~ Analyse and describe the application of the concepts of energy and momentum to the design and development of a wide range of collision and impact - absorbing devices used in everyday life. ~ Analyse ways in which an understanding of the dynamics of motion relates to the development and use of technological devices, including terrestrial and space vehicles, and the enhancement of recreational activities and sports equipments.</p>
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STUDENT WORKSHEET

<p>Gr.11 Identify and describe Inventions that made an impact in the areas of transportation and safety.</p>	<p>Gr.12 Identify and describe Inventions that enhanced space vehicles, recreational activities and sports equipment.</p>
<p>Transportation Invention: Description:</p> <p>Inventor: Time Period:</p>	<p>Invention: Inventor: Time Period: Area of enhancement:(e.g. sports)</p> <p>Description of Invention:</p>
<p>Transportation Invention: Description:</p> <p>Inventor: Time Period:</p>	<p>Invention: Inventor: Time Period: Area of enhancement:(e.g. sports)</p> <p>Description of Invention:</p>
<p>Transportation Invention: Description:</p> <p>Inventor: Time Period:</p>	<p>Invention: Inventor: Time Period: Area of enhancement:(e.g. sports)</p> <p>Description of Invention:</p>
<p>Choose one Invention in the area of Transportation for further investigation. State why you made this choice.</p>	<p>Choose one sports/recreational Invention for further investigation. State why you made this choice.</p>

Suggested Exhibits

<p>All sections of the exhibit present information that compliments this strand, however here is a list of some names to look for;</p> <table border="0"> <tr> <td>Benjamin Montgomery</td> <td>Elijah McCoy</td> </tr> <tr> <td>J. Ricks</td> <td>Andrew J. Beard</td> </tr> <tr> <td>A. B. Blackburn</td> <td>James Wormley</td> </tr> <tr> <td>Humphrey H. Reynolds</td> <td>Richard B. Spikes</td> </tr> <tr> <td>Granville T. Woods</td> <td>Garrett Morgan</td> </tr> <tr> <td>J. F. Pickering</td> <td>Herbert Julian</td> </tr> <tr> <td>Troy Jackson</td> <td>Jonie M. T. Moore</td> </tr> </table>	Benjamin Montgomery	Elijah McCoy	J. Ricks	Andrew J. Beard	A. B. Blackburn	James Wormley	Humphrey H. Reynolds	Richard B. Spikes	Granville T. Woods	Garrett Morgan	J. F. Pickering	Herbert Julian	Troy Jackson	Jonie M. T. Moore	<p>All sections of the exhibit present information that compliments this strand, however here is a list of names to look for;</p> <table border="0"> <tr> <td>J. Ricks</td> <td>L.F. Brown</td> <td>Neruda Williams</td> </tr> <tr> <td>W. D. Davis</td> <td>G. Cook</td> <td>Langley A. Walker</td> </tr> <tr> <td>Robert F. Flemming</td> <td>J. H. Dickerson</td> <td>Darnell Thomas</td> </tr> <tr> <td>Isaac R. Johnson</td> <td>William T. Osborne</td> <td>Jessie Lee</td> </tr> <tr> <td>Drummer</td> <td></td> <td></td> </tr> <tr> <td>Dr. George F. Grant</td> <td>Maj. Frederick D. Gregory</td> <td></td> </tr> <tr> <td>Robert E. Shurney</td> <td>Lonnie G. Johnson</td> <td>Huey Douglas</td> </tr> <tr> <td>Keith B. Gentry</td> <td>Gregory L. McCowan</td> <td></td> </tr> </table>	J. Ricks	L.F. Brown	Neruda Williams	W. D. Davis	G. Cook	Langley A. Walker	Robert F. Flemming	J. H. Dickerson	Darnell Thomas	Isaac R. Johnson	William T. Osborne	Jessie Lee	Drummer			Dr. George F. Grant	Maj. Frederick D. Gregory		Robert E. Shurney	Lonnie G. Johnson	Huey Douglas	Keith B. Gentry	Gregory L. McCowan	
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Strand	Grade 11	Grade 12
Technological Education	Integrated Technologies ~ Demonstrate understanding of the principles of science underlying applications of technology in everyday life. ~ Describe the importance of contributions of Canadian scientists to the development of modern everyday technologies.	

STUDENT WORKSHEET

Gr. 11&12 Describe the contributions made by African Canadian Scientists to everyday technologies.	Optional: Complete the student worksheet entitled: The Scientific Contributions of African Canadians
Scientist/Inventor: Time Period: Invention: How has this invention contributed to everyday life?	Scientist/Inventor: Time Period: Invention: How has this invention contributed to everyday life?
Scientist/Inventor: Time Period: Invention: How has this invention contributed to everyday life?	Scientist/Inventor: Time Period: Invention: How has this invention contributed to everyday life?
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<p>Name of Individual: Time Period: Role of Individual:</p> <p>Historical Evidence:</p>	<p><u>Complete the Grade 11 Student worksheet Technological Education strand/African Canadians worksheet.</u> Choose one African Canadian Scientist/Inventor and describe any of the social changes resulting from his/her work.</p>
<p>Name of Individual: Time Period: Role of Individual:</p> <p>Historical Evidence:</p>	<p><u>Complete the Grade 11 Student worksheet Physics strand</u> Choose one of the Inventions in Transportation / Communications and describe the impact on Canadian life.</p>
<p>Name of Individual: Time Period: Role of Individual:</p> <p>Historical Evidence:</p>	<p><u>Complete the Grade 9 Student worksheet Physics strand</u> Choose one of the Electrical Inventions and describe the impact on Canadian Life.</p>
<p>Name of Individual: Time Period: Role of Individual:</p> <p>Historical Evidence:</p>	<p><u>Complete the Grade 7 Student worksheet Structures and Mechanisms</u> Choose one household Invention and describe the social impact.</p>

Suggested Exhibits

<p>The Slave Trade Emancipation Proclamation Henry E. Baker Josiah Henson Marcus Garvey Dr. Yosef A.A. Ben Jochannan Ivan Van Sertima Carter G. Woodson</p>	<p>(Recent museum additions to be included)</p>
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AFTER YOUR TOUR OF THE EXHIBIT

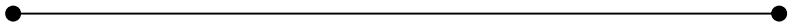
Take time to complete this worksheet. Make sure that all the spaces are filled in.

Compare what you knew before the exhibit with what you now know. In which areas did you increase in knowledge?

Look at your Tally Column. What are your most interesting observations? What conclusions can you draw?

How did what you learn today influence your views on Scientist and Inventors of African Descent?

Which inventions did you find to be the most interesting?



SUGGESTED FOLLOW UP ACTIVITIES

- | |
|---|
| 1. Write a letter to the Black Scientist and Inventors Museum with your comments and suggestions. |
| 2. Research one of the Scientists or Inventions observed at the exhibit. |
| 3. Make a model of one of the inventions. |
| 4. Create your own inventions based on an invention seen at the exhibit. |
| 5. Generate discussions/debates around issues relating to the contributions made by scientist of African Descent. |

