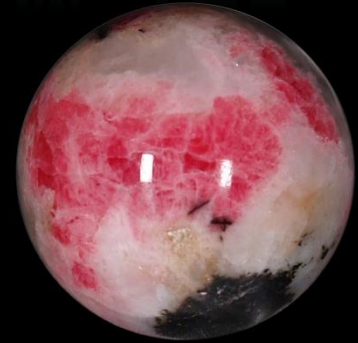


# A HISTORY OF FLUORESCENT MINERALS FROM THE ILÍMAUSSAQ COMPLEX, SOUTH GREENLAND

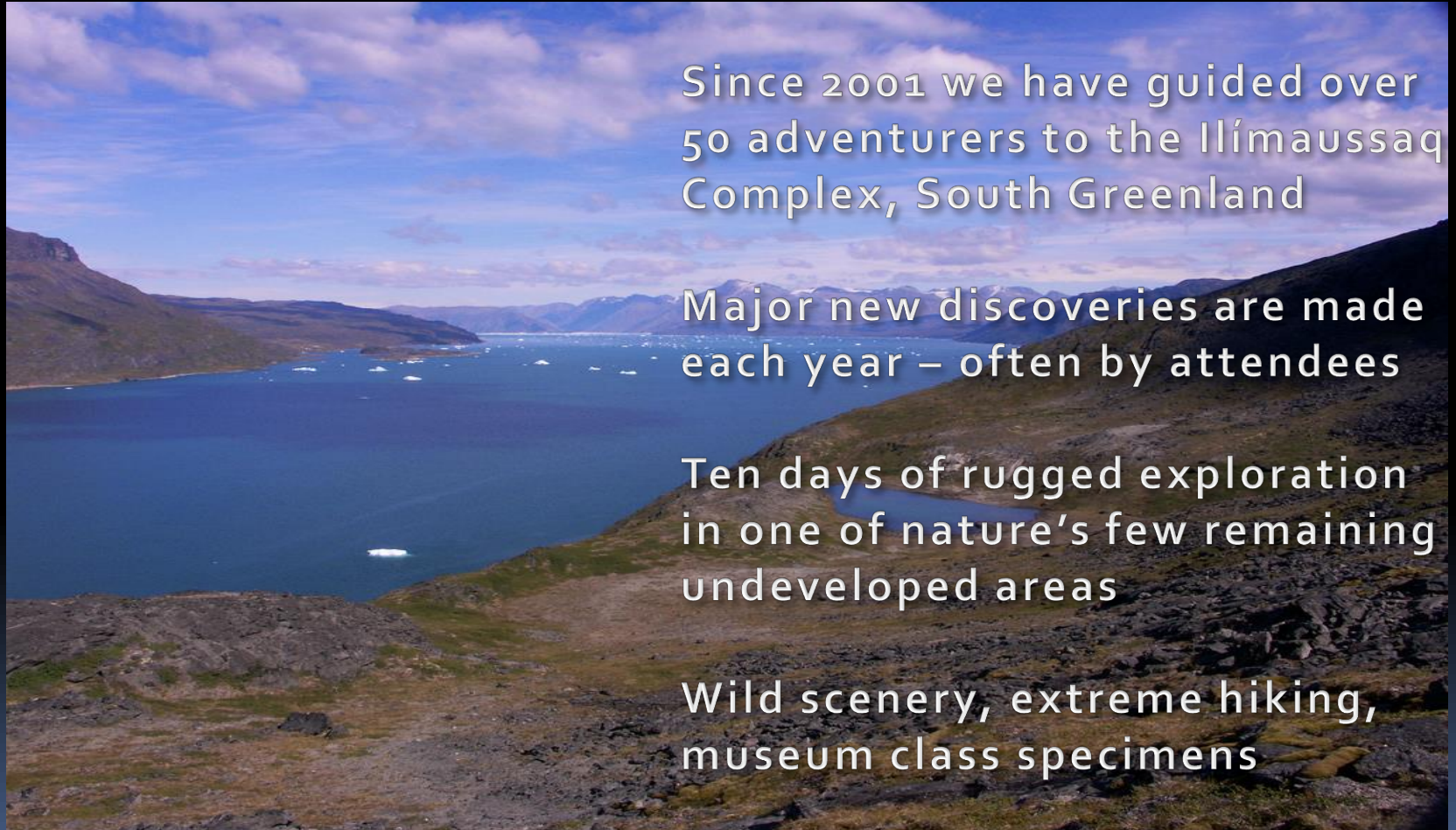


The Ilímaussaq complex is one of the world's most fascinating igneous complexes. The abundance of rare elements has resulted in more than two hundred and twenty-five different minerals and many unique fluorescent mineral specimens. Thirty minerals were first discovered and described in the complex and twelve are unique to it.

I first visited this complex in 2001 and have returned every year since. Each year fantastic new discoveries are made, earning this complex a reputation as a "World Class" fluorescent mineral locale.

<http://www.minershop.com>

# Greenland Geo-Adventure Tours



Since 2001 we have guided over 50 adventurers to the Ilímaussaq Complex, South Greenland

Major new discoveries are made each year – often by attendees

Ten days of rugged exploration in one of nature's few remaining undeveloped areas

Wild scenery, extreme hiking, museum class specimens



# 2008 Tour Groups



15 people joined us this year (2008) for two ten-day tours. I spent one month in Greenland.

# Why a History?

- Before 2001 tugtupite only major fluorescent from Greenland (occasional reports of sodalite and beryllite)
- UV prospecting active since 2001, new minerals found each year
- Like collecting in Franklin in the 50's??? – lots of discoveries, lots of questions
- MinerShop only active prospector for fluorescent minerals



# Definitions

- **Tenebrescent** – (ala hackmanite) Changes color upon exposure to UV (sunlight, UVB, UVC)
- **Phosphorescent** – Continues to glow after the lights go out
- **Alkaline Complex** – igneous rock mass that consists largely of feldspars and feldspathoids and commonly contain other alkali-rich minerals, but lack quartz
- **Fjord** – Deep water inlets found all along the coast of Greenland

# Tenebrescence (as in hackmanite)



- Color change caused by UV
- Sunlight causes tugtupite to darken
- Usually SW required for sodalite to darken (some will darken with sunlight)
- Sodalite can fade in seconds upon exposure to artificial light; retains color longer in the dark
- Tugtupite doesn't fade quickly, and is easily replenished by sunlight

# 2008 *Favorite* New Find



Deeply tenebrescent sodalite on unknown matrix



# Blue Sodalite (tenebrescent)



# Blue Sodalite - LW Tenebrescent





# Blue Sodalite - SW Tenebrescent





# Tugtupite



*"For ages, the Inuit of Greenland have understood the power of tugtupite. Legend has it that lovers can cause the stone to glow fiery red just from the heat of their romance. The brilliance and vibrant colors announce the intensity of their love."*

# Nuummite



# Greenlandite



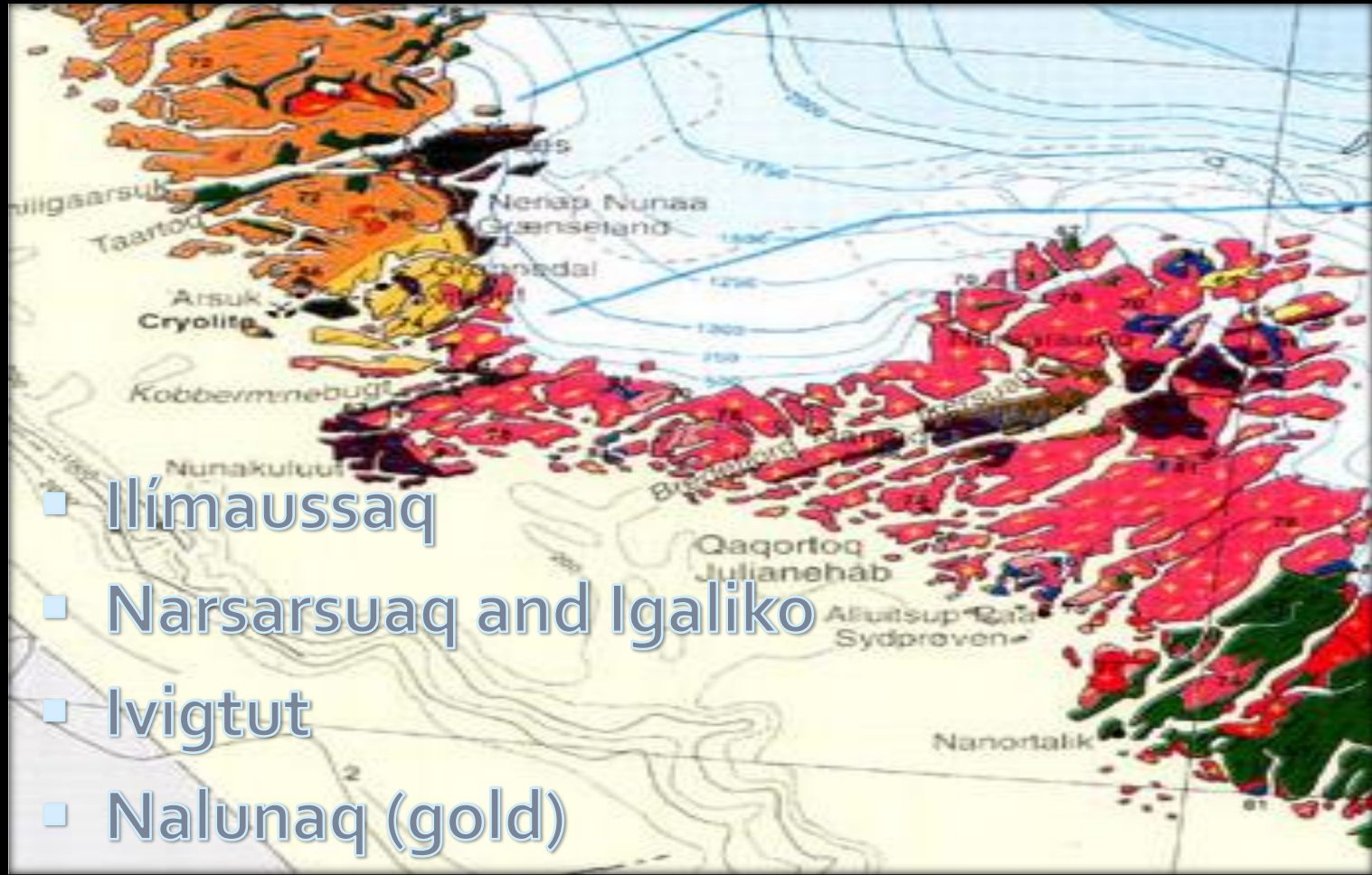
The oldest gemstone on earth



# Ussingite



# South Greenland Complexes



- Ilímaussaq
- Narsarsuaq and Igaliko
- Ivigtut
- Nalunaq (gold)



# The Ilimaussaq Complex

- 1,200 mya was the site of volcanic activity.
- Lavas and cone scraped away by erosion; glaciers and water have dug out fjords.
- Fjords and valleys offer unique glimpse into geological processes in depths of the volcano.
- Zones remarkably rich in rare rocks and minerals.



# Major Rocks/Minerals

- Nepheline syenite (no quartz)
- Sodalite – NUMEROUS varieties
- Lujavrite (syenite rich in aegirine or arfvedsonite)
- Feldspar
- Eudialyte
- Uranium
- REEs
- Beryllium





# Collecting in Greenland

## Ujarassiorit

- Vast expanses – hard to convey in photos
- Backpack everything out
- Limited collecting season
- No roads, poor infrastructure
- Export license required
- Increasing regulations/government oversight
- Hand carried specimens restricted out of country

# Fluorescent Mineral History of Ilímaussaq

- Tugtupite reported in the '60s
- Occasional reports of sodalite over the years
- 2001 - Chkalovite, green sodalite (hackmanite)
- 2002 - New varieties of tugtupite, crystals, yellow sodalite
- 2003 - Ussingite, tug, chkalovite, polyolithionite
- 2004 - discoveries on Taseq – major combos, analcime
- 2005 – new gem tugtupite mine
- 2006 – Expansion of Taseq locales
- 2007 – blue sodalite
- 2008 – red sodalite, New varieties Taseq

# Identified Fluorescent Minerals

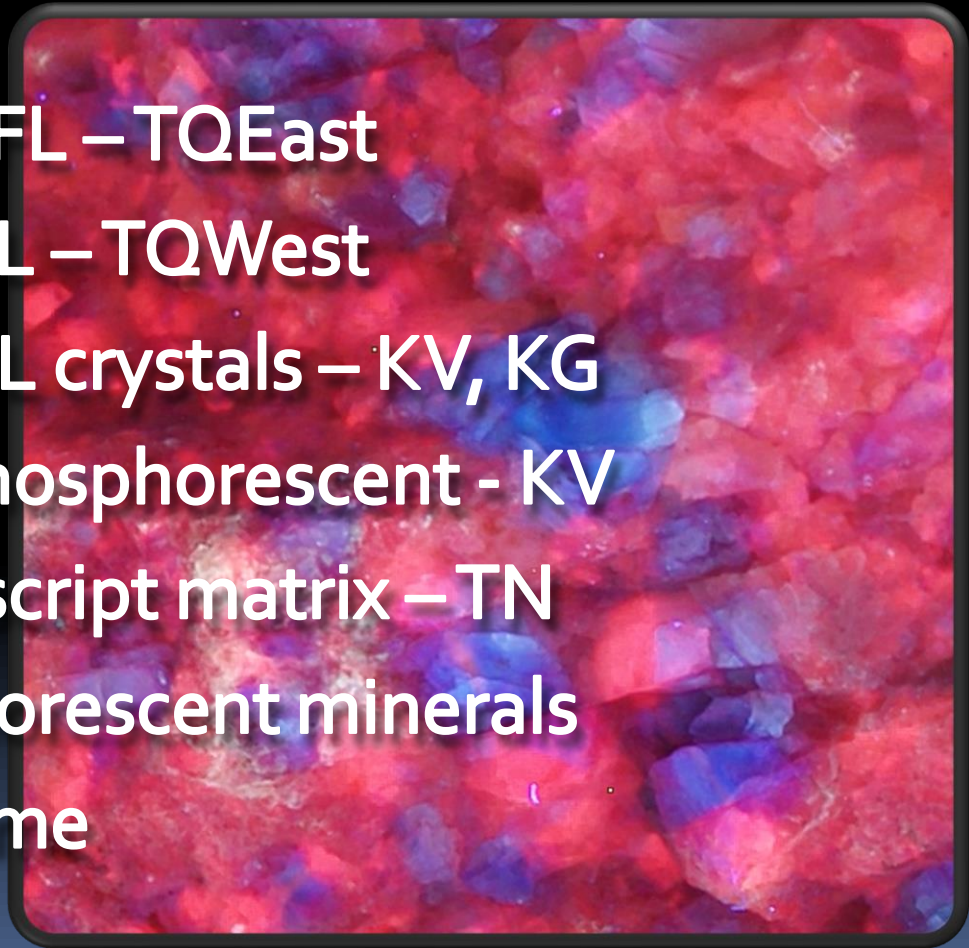
- Sodalite – 7 varieties
- Tugtupite – 4 varieties
- Chkalovite
- Ussingite
- Sorensenite
- Polylithionite
- Natrolite
- Fluorite
- Analcime
- Uranyl Salts
- Catapleite
- Leucophanite
- Villiaumite
- Beryllite
- Microcline
- Quartz\*

25 Identified varieties, 100's of combinations

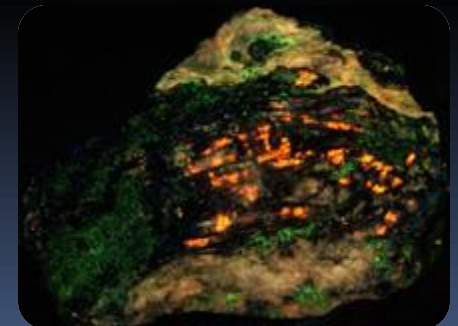
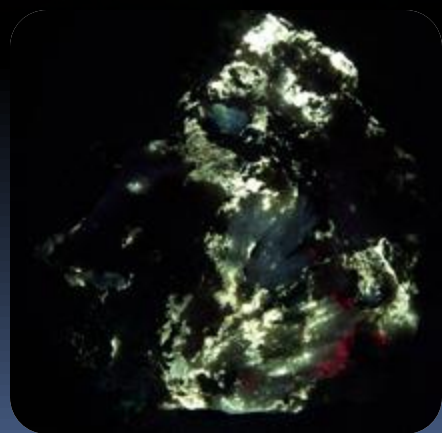
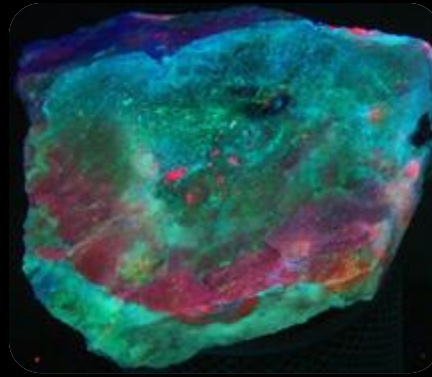
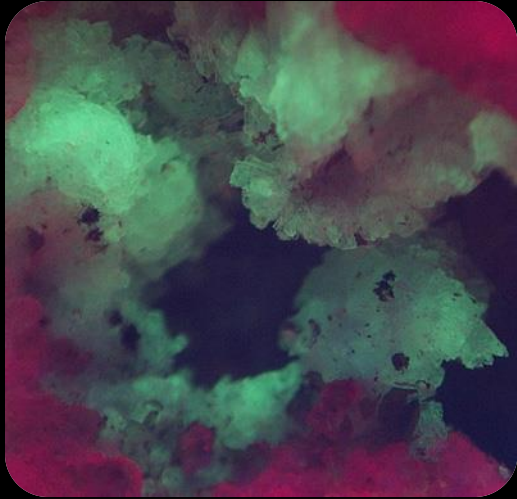


# UN-Identified Fluorescent Minerals (partial list)

- Red Crystals, blue FL – TQEast
- Tan natural, blue FL – TQWest
- Numerous green FL crystals – KV, KG
- Bright white FL, phosphorescent - KV
- Yellow FL, non-descript matrix – TN
- Numerous phosphorescent minerals
- Purple FL in analcime



# Mystery Peeks



# Ilimaussaq - List of Minerals

Aegirine	<b>Chalcedony</b>	Fluorapophyllite	Linarite	Nontronite	Siderite	<b>Ussingite</b> *
Aenigmatite	Chalcocite	<b>Fluorite</b> *	Litharge	Odintsovite	Silver	Valentinite
<b>Albite</b> *	Chalcopyrite	Galena	Loellingite	Orthojoaquinite-	Skinnerite	Vesuvianite
Allanite-(Ce)	Chalcostibite	Garnet-group	Lomonosovite	(La)	Skutterudite	<b>Villiaumite</b> *
Allargentum	Chalcothallite	Genthelvite	Lomonosovite-β	Orthoclase	<b>Sodalite</b> *	Vinogradovite
<b>Analcime</b> *	<b>Chkalovite</b> *	Gerasimovskite	Lorenzenite	Palygorskite	<b>Soda-microcline</b> *	Vitusite-(Ce)
Ancylite-(La)	Chlorite-group	Gibbsite	Lovdarite	Pearceite	<b>Soda-orthoclase</b> *	Vrbaite
Antigorite	Chrysocolla	Gmelinite	Lovozerite	<b>Pectolite</b> *	<b>Sorensenite</b> *	Vuonnemite
Antimony	Connellite	Goethite	Lueshite	Plagioclase	<b>Sphalerite</b> *	Westerveldite
Arfvedsonite	Cookeite	Graphite	Magnetite	Plattnerite	Stannite	Whewellite
Argentite	Copper	Gudmundite	Malachite	Polybasite	Steenstrupine-	<b>Willemite</b>
Astrophyllite	CovelliteCuprite	Halloysite	Marcasite	<b>Polythionite</b> *	(Ce)	<b>Zircon</b> *
Augite	Cuprostibite	Hastingsite	<b>Microcline</b> *	<b>Prehnite</b>	Stilbite	
Avicennite	Diaspore	Hedenbergite	Molybdenite	Pyrite	Stillwellite	
Azurite	Digenite	Helvite	Monazite-(Ce)	Pyrochlore	Synchysite-(Ce)	
Barylite	<b>Diopside</b>	Hemimorphite	Montmorillonite	Pyrolusite	Tetrahedrite	
Bastnaesite-(Ce)	Djerfisherite	Herschelite	Mosandrite	Pyrophanite	Tetranatrolite	
Bertrandite	Djurleite	Hiortdahlite	Murmanite	Pyrrhotite	Thalculusite	
<b>Beryllite</b> *	Dyscrasite	Hisingerite	Muscovite	<b>Quartz</b> *	Thermonatrite	
Beudantite	Elpidite	Hydrocerussite	Nabesite	Rhabdophane-	Thorianite	
Biotite	Emeleusite	Ilimaussite	Nacareniobsite-	(Ce)	Thorite	
Bornite	Ephesite	Ilmenite	(Ce)	Riebeckite	Tin	
Breithauptite	Epididymite	Ilvaite	Nahcolite	Rinkite	Titanite	
Britholite-(Ce)	Epidote	Joaquinite	Narsarsukite	Rohaite	Todorokite	
Brochantite	Epistolite	Katophorite	<b>Natrolite</b> *	<b>Rosenbuschite</b>	Troilite	
<b>Calcite</b> *	Eudialyte	Komarovite (var.	Naujakasite	Rutile	Trona	
Cancrinite	Eudidymite	Sodium-K.)	Nenadkevichite	Sauconite	<b>Tugtupite</b> *	
Carbonate-	Evenkite	Kvanefjeldite	Nepheline	Seinaejokite	Tundrite-(Ce)	
hydroxylapatite	Famatinite	Lead	Neptunite	Semenovite-(Ce)	Tundrite-(Nd)	
<b>Catapleite</b> *	Fayalite	Lepidolite	Nickeline	Senarmontite	Tuperssuatsiaite	
Cerussite	Fersmite	<b>Leucophanite</b> *	Niobophyllite	Sepiolite	Turkestanite	
Chabazite	<b>Fluorapatite</b> *	Leucosphenite		Serandite		



# What's special about Greenland rocks?

- Wide variety – bright 6 and 7 color combinations
- Rarity
- Widely varied responses
- Large specimens, rich coverage
- Tenebrescence (more later)
- Phosphorescence
- New discoveries yearly



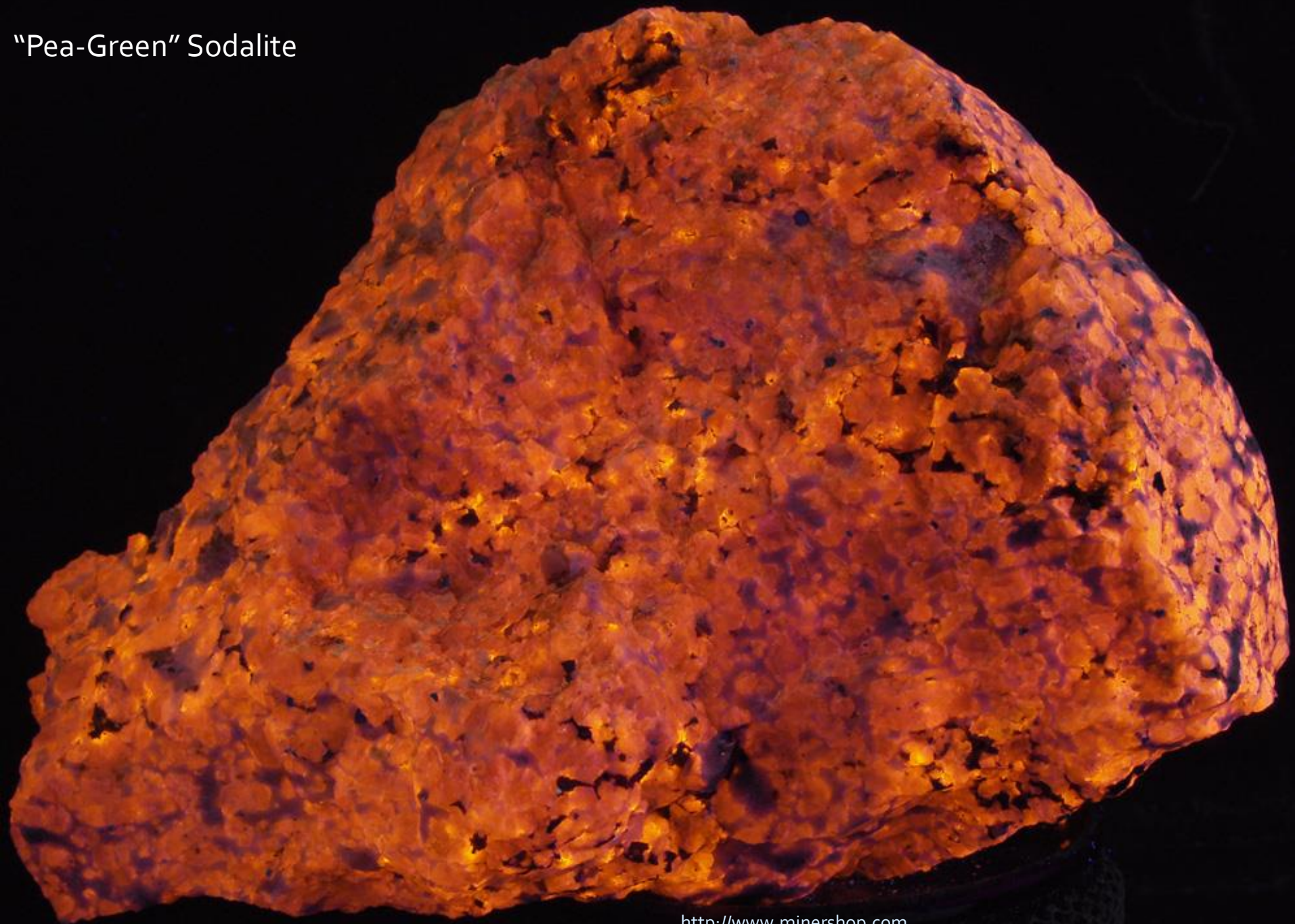
What's special?

For example...

## Bright Sodalites, wide variety

- Blue
- Green
- Red
- Yellow
- White
- Tenebrescent
- Phosphorescent

"Pea-Green" Sodalite





What's special?

For example...

# Rare Gem Fluorescents

Tugtupite – one of the world's rarest gemstones and known as the "King" of fluorescent minerals.

What's special?

For example...

Unusual varieties, strong  
phosphorescence

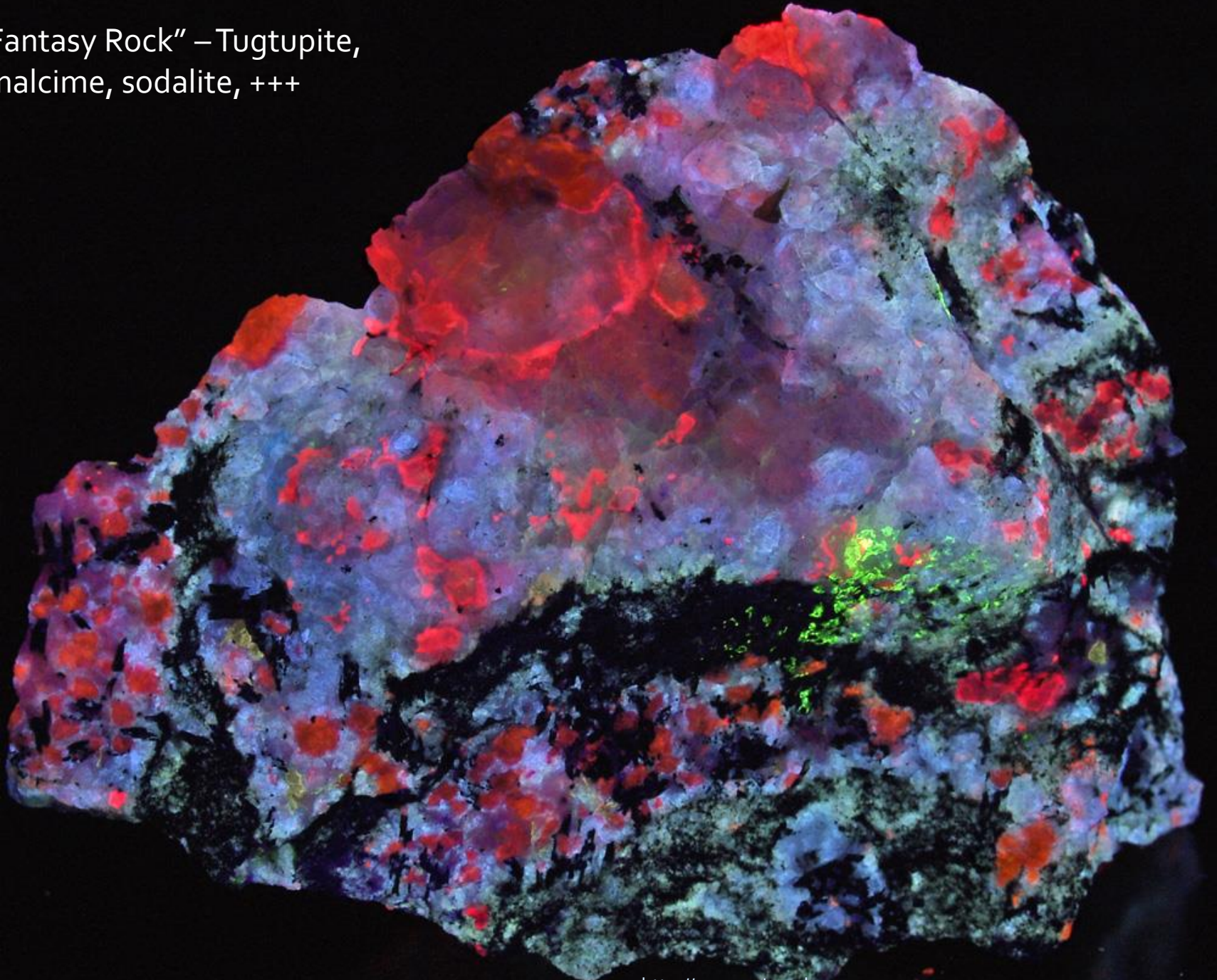
What's special?

For example...

Extreme combination  
specimens



"Fantasy Rock" – Tugtupite,  
Analcime, sodalite, +++



What's special?

For example...

New varieties of  
tugtupite, crystals

What's special?

For example...

Large gem quality, bright  
and bold



Gem sodalite



# Collecting in Ilímaussaq

- 8 km x 24 km, spans two fjords and a major valley
- 6+ (identified) very productive locales, access by 4-wheel and boat
- From sea-level to 700m (or higher)
- Alkaline complex, friable rocks mostly exposed – little vegetation
- Long days, short nights
- Rich in both fluorescent and non-fluorescent minerals

# Satellite View



Image © 2008 DigitalGlobe

<http://www.minershop.com>



# Topo Map



# Locales - (date of discovery)

- Kvanefjeld – 1958, 2001
- Kangerluarsuq - 2001
- Tunuliarfik (north shore) – 2002, 2003
- Taseq Slope (east) - 2002
- Taseq Slope (west) – 2004, 2006
- Tunuliarfik (south shore) – 2007
- 2008 – New gem tugtupite mine....

# Kvanefjeld (1958)

- Primary source for gem tugtupite
- Location of uranium adit
- Worked since the early '60s
- Actively being explored for commercial mining
- Heavily explored (by Ilímaussaq standards) by us for FL minerals
- Fluorescent mineral discoveries:
  - Chkalovite, tugtupite varieties, sorensenite, blue unk, green crystals



Kvanefjeld

# The Tugtupite Mines



Photo courtesy Herb Yeates



Kvanefjeld

# Mining Tugtupite



08 11 2002 09:25

<http://www.minershop.com>



Kvanefjeld

# Gem Tugtupite





Kvanefjeld

# Gem Tugtupite Bracelet



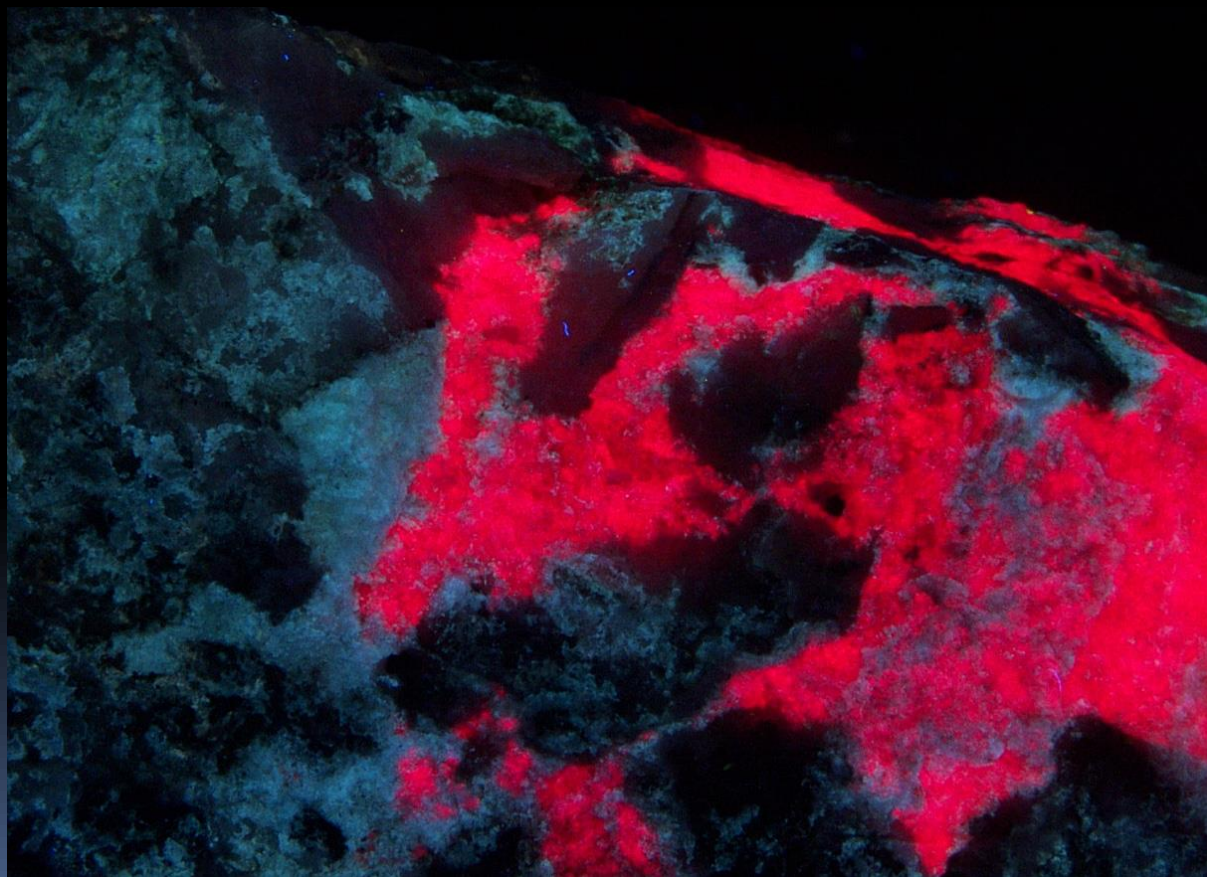
Kvanefjeld

# Tugtupite (2004)





# Tugtupite and Beryllite





Kvanefjeld

# Sorensenite in-situ (2008)





Kvanefjeld

# Mining Sorensenite



Kvanefjeld

# Sørensenite

(2001)



Rare single locale – sodium-tin-beryllium silicate



# Taseq Slope (2002 – 2004)

- 8 km wide, 500m to 700m
- Two major collecting areas – east & west
- Subject of intense study in the '60s for beryllium
- Fluorescent mineral discoveries:
  - “Taseq Tugtupite”, “Fantasy Rock”, Sodalite, Tugtupite & Polylithionite, Analcime, Chkalovite, Natrolite, Tugtupite Crystals, numerous unknowns

# Taseq Slope Panorama



East (2002)

West (2004)

Taseq

# Ascent up the Slopes (TQE)





Taseq  
Rock  
Slope





Taseq

# Boulder tipping



Taseq

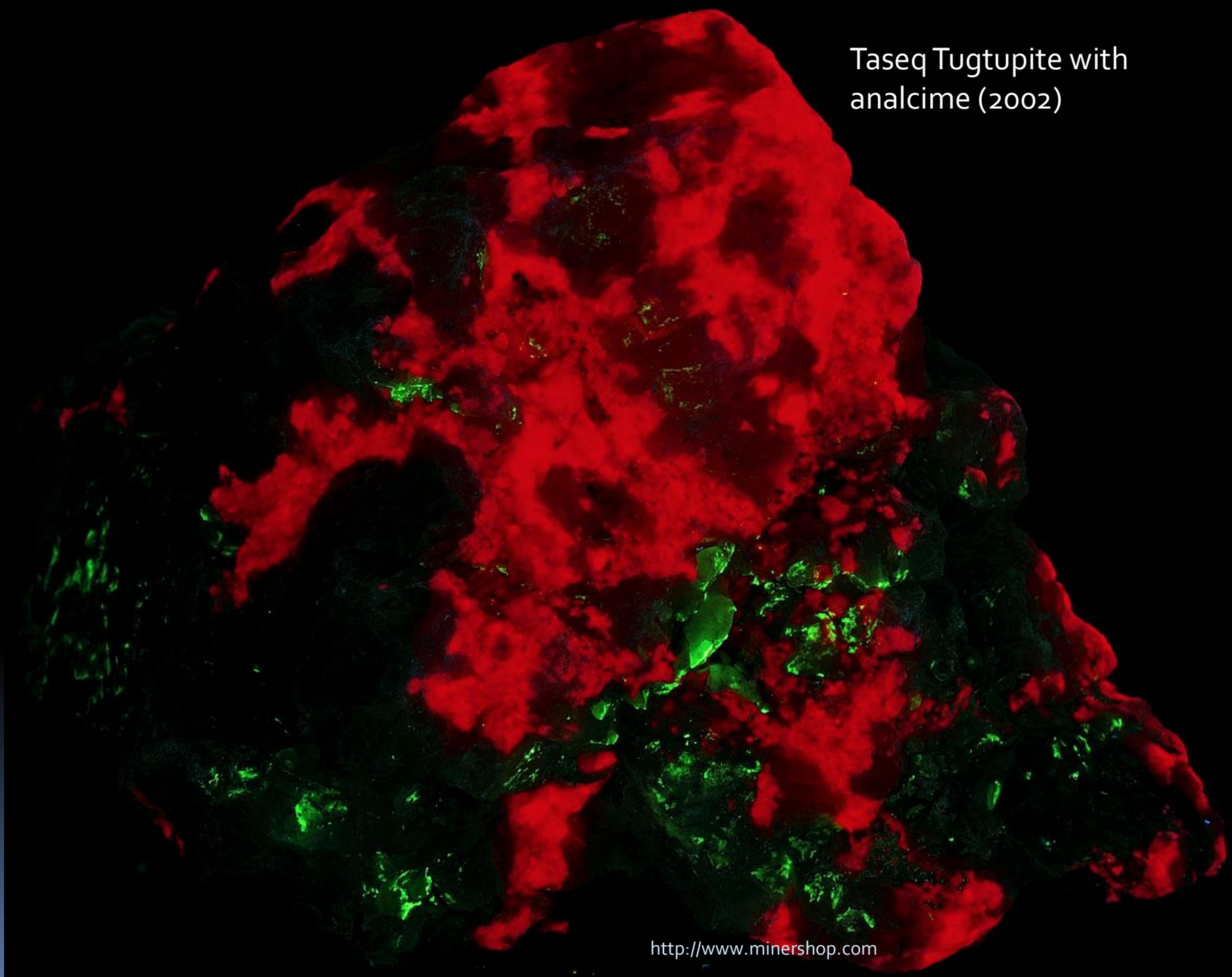
# Results of Boulder Tipping

“Looks like a  
Candy Store in the  
Rain.”





Taseq Tugtupite with  
analcime (2002)





Tugtupite crystals  
(2003)





Taseq

# Collecting July 4th






Fantasy Rock – Sodalite,  
analcime, tugtupite, +++  
(2005)



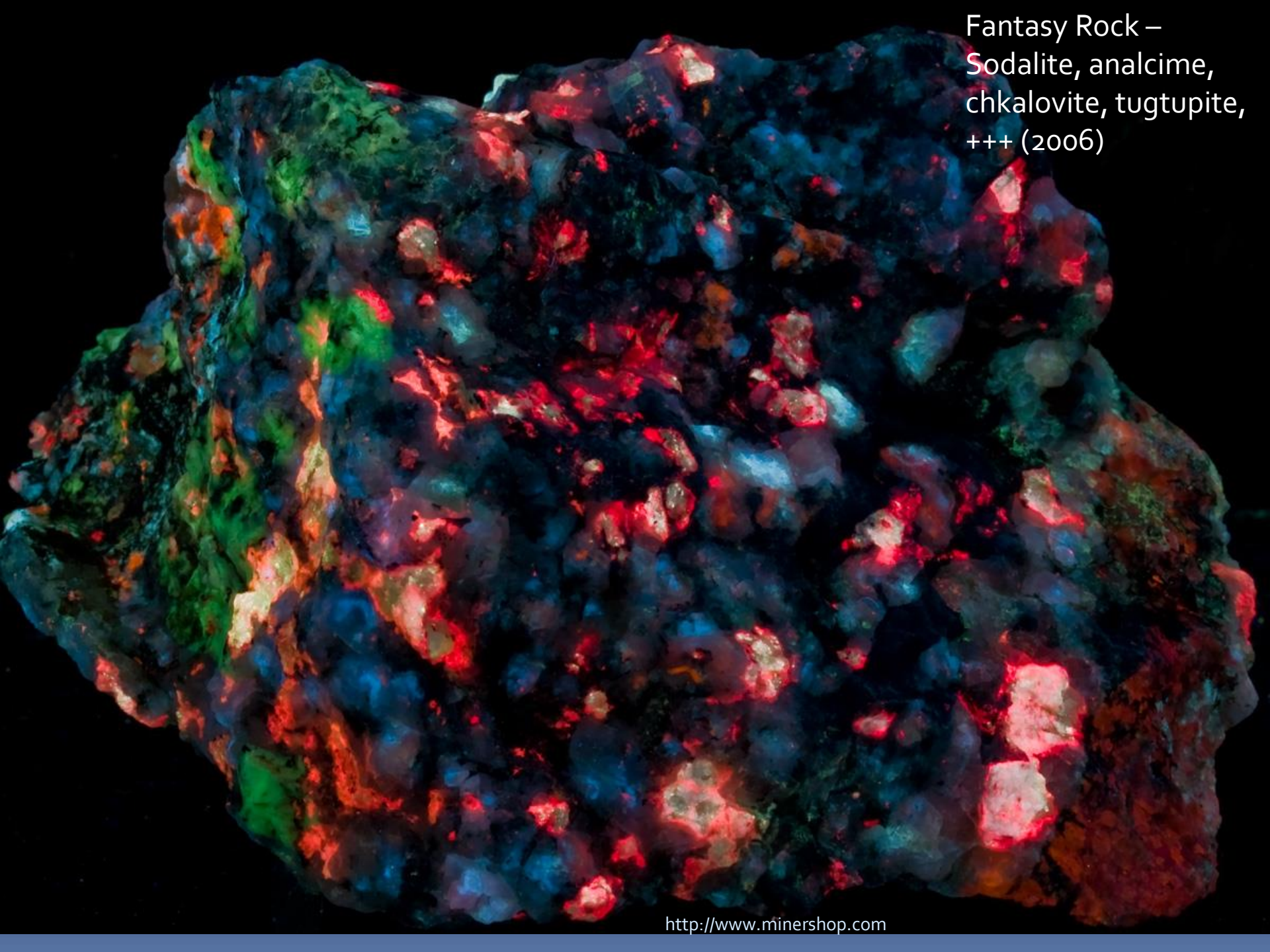


A large, irregularly shaped rock specimen is shown against a dark background. The rock exhibits a complex pattern of fluorescence, with bright red and green spots and streaks scattered across a dark, almost black matrix. The red fluorescence is particularly prominent in the upper and lower right sections, while green fluorescence is more concentrated in the lower right and central areas. The overall appearance is highly colorful and visually striking.

Fantasy Rock –  
Sodalite, analcime,  
chkalovite, tugtupite,  
+++ (2006)

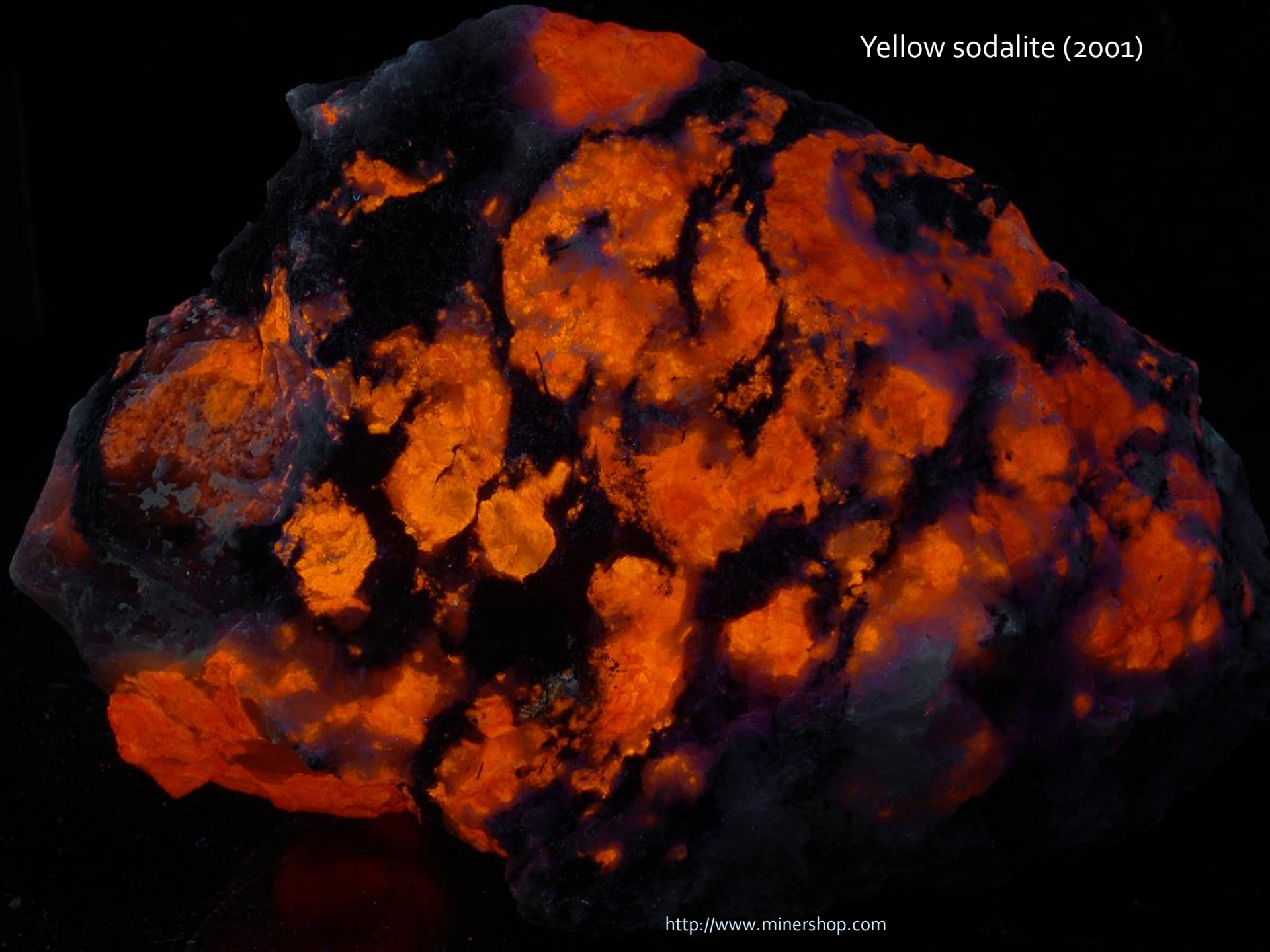


Fantasy Rock –  
Sodalite, analcime,  
chkalovite, tugtupite,  
+++ (2006)





Yellow sodalite (2001)





Yellow sodalite





Yellow sodalite



# Tunuliarfik – 2002, 2003

- Type locale for tugtupite (Tugtup Agtakorfia)
- Access only by boat
- High cliffs – steep ascent
- Fantastic sodalite/ussingite/tugtupite specimens
- New workings 2008 – deeply tenebrescent sodalites (South shore)
- Fluorescent mineral discoveries: Tugtupite, Ussingite, Sodalite, Chkalovite, Polyolithionite, +++



Tunuliarfik

# Shoreline Access





Tunuliarfik

# Tugtup Agtakorfia





Tunuliarfik

(Tugtup Agtakorfia) **Tugtupite in-situ**



Tunuliarfik

# Sodalite Beach





Tunuliarfik

# Navigating the Cliffs





Tunuliarfik

# Not just for Rocks!

- 20 codfish (kept)
- 3 trout
- Backpack full of mussels
- ...All in a couple of hours





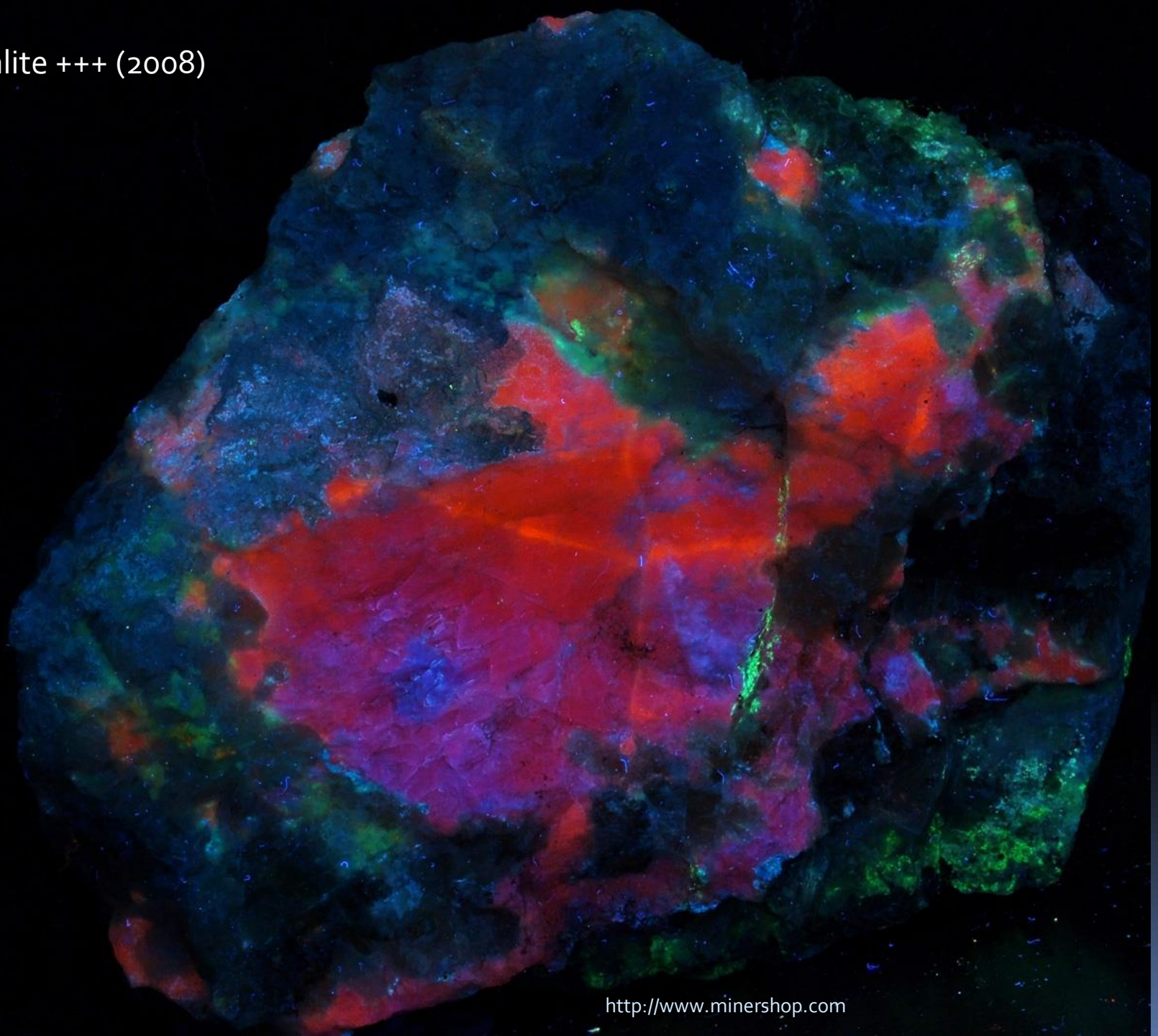
Tugtupite (2001)



Ussingite/Tugtupite +++



Sodalite +++ (2008)



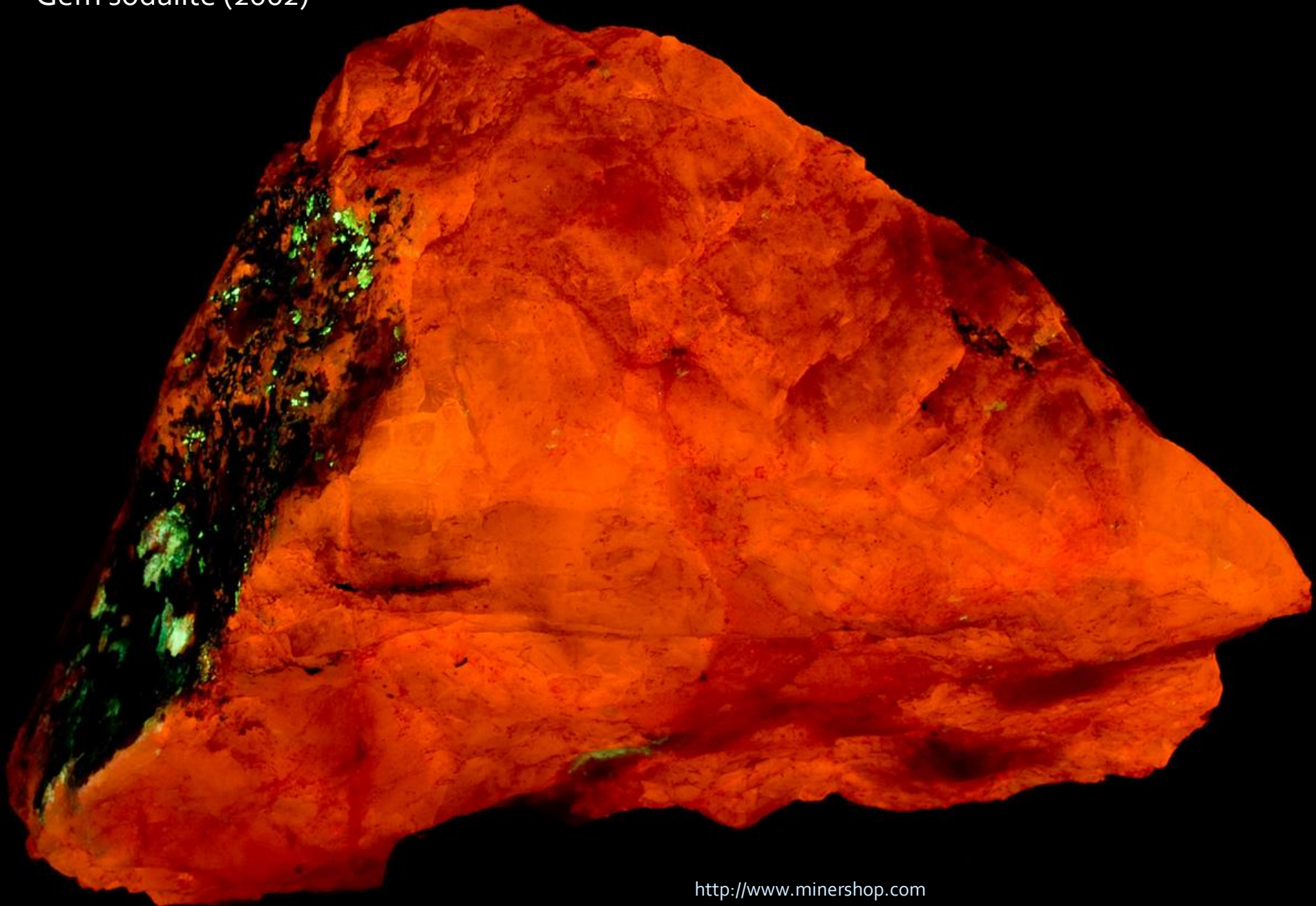


Tenebrescense



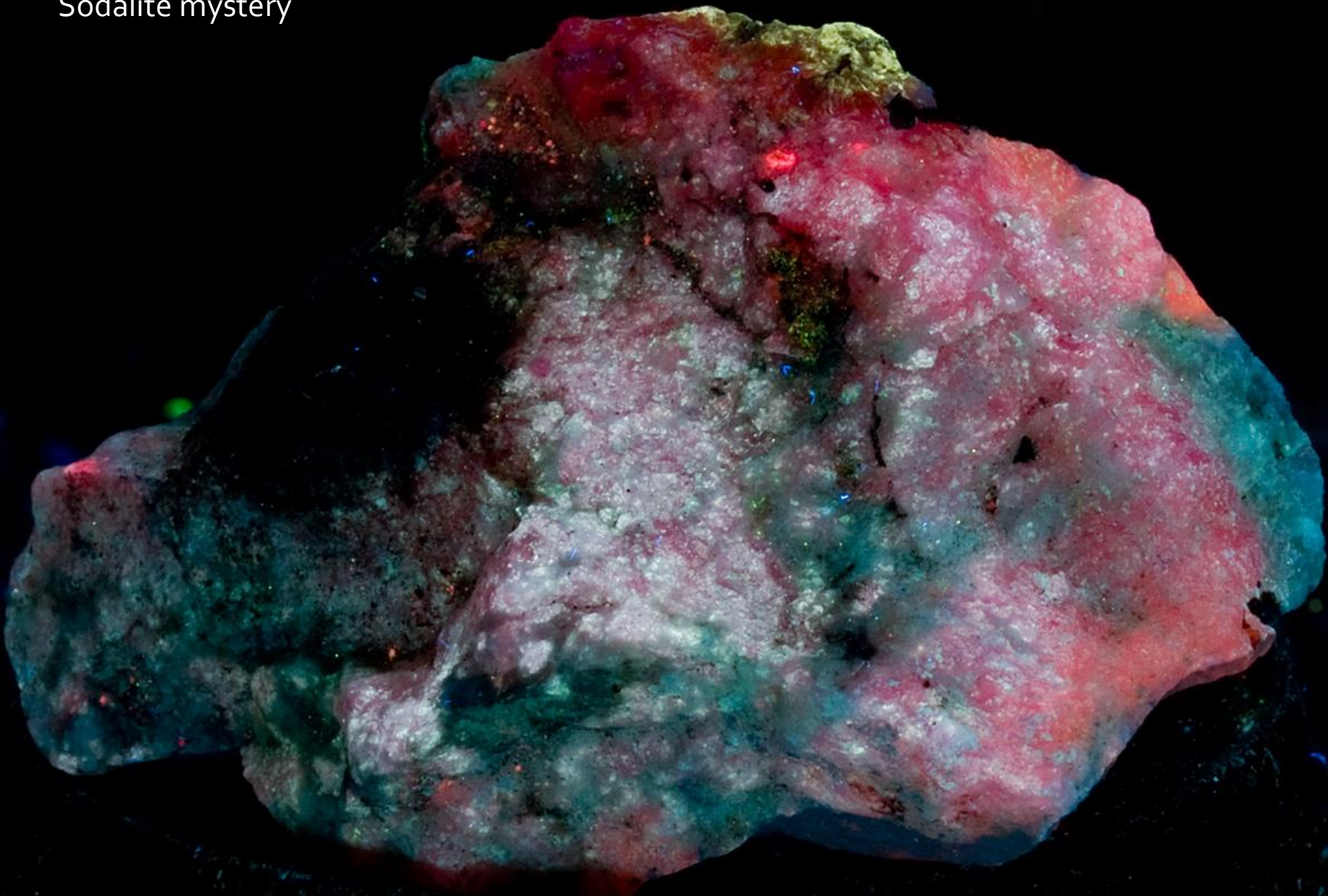


Gem sodalite (2002)

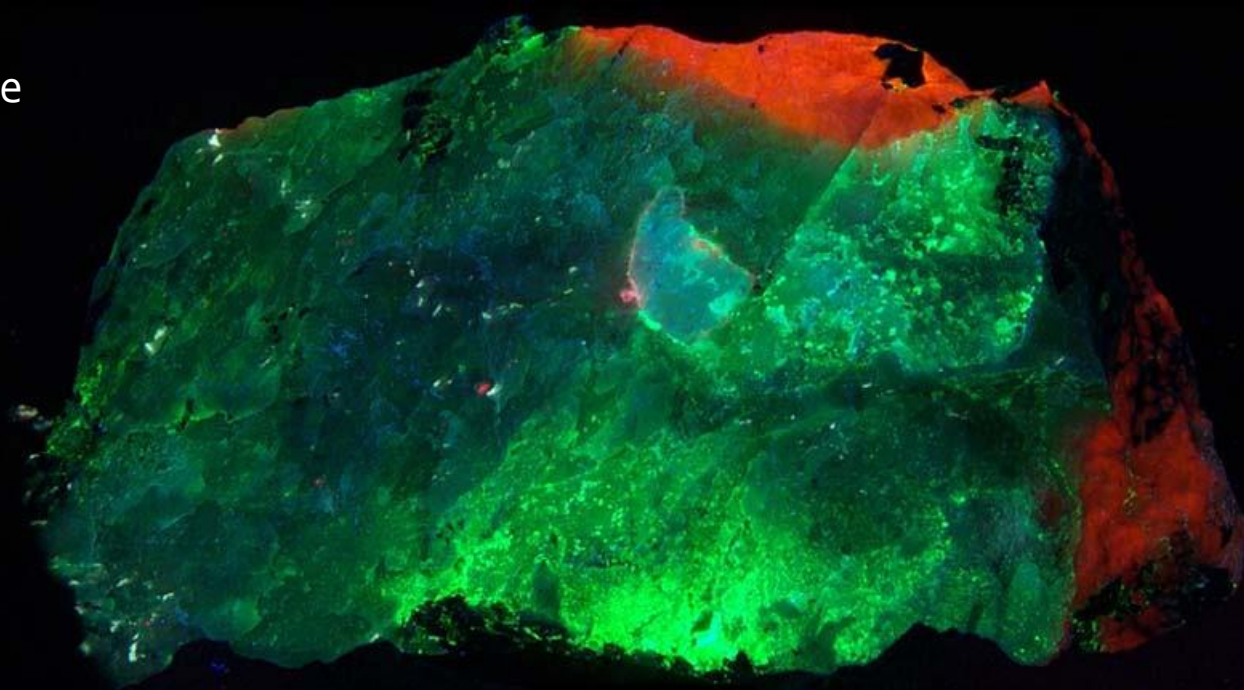




# Sodalite mystery



# Ussingite



*Shortwave*



*Natural*



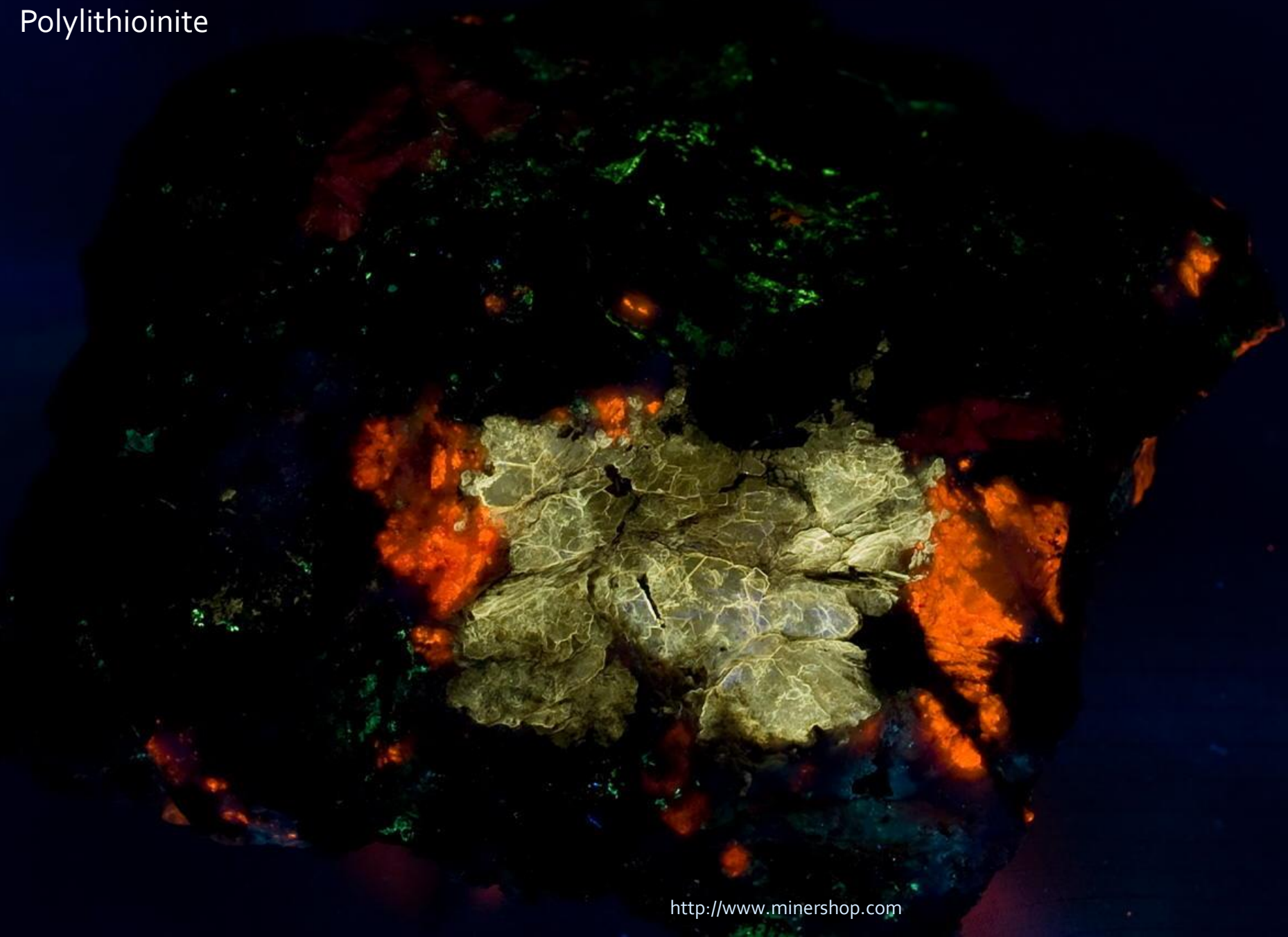
*Longwave*

**Locale: Tunuliarfik, Illimaussaq  
Complex, Greenland**  
**Size and Weight:**  
**6" x 3" x 2", 1lb, 6.8ozs**





Polythionite



# Kangerluarssaq 2001, 2005

- Access by boat
- Vast area, new tugtupite mine
- Kakortokite layers
- Original find of green sodalite (2001), new tugtupite mine, polyolithionite, "Checkers" sodalite, numerous unknowns



Kangerluarsaq

# Fjord (bay) at Kanger



Kangerluarsaq

# UV Prospecting





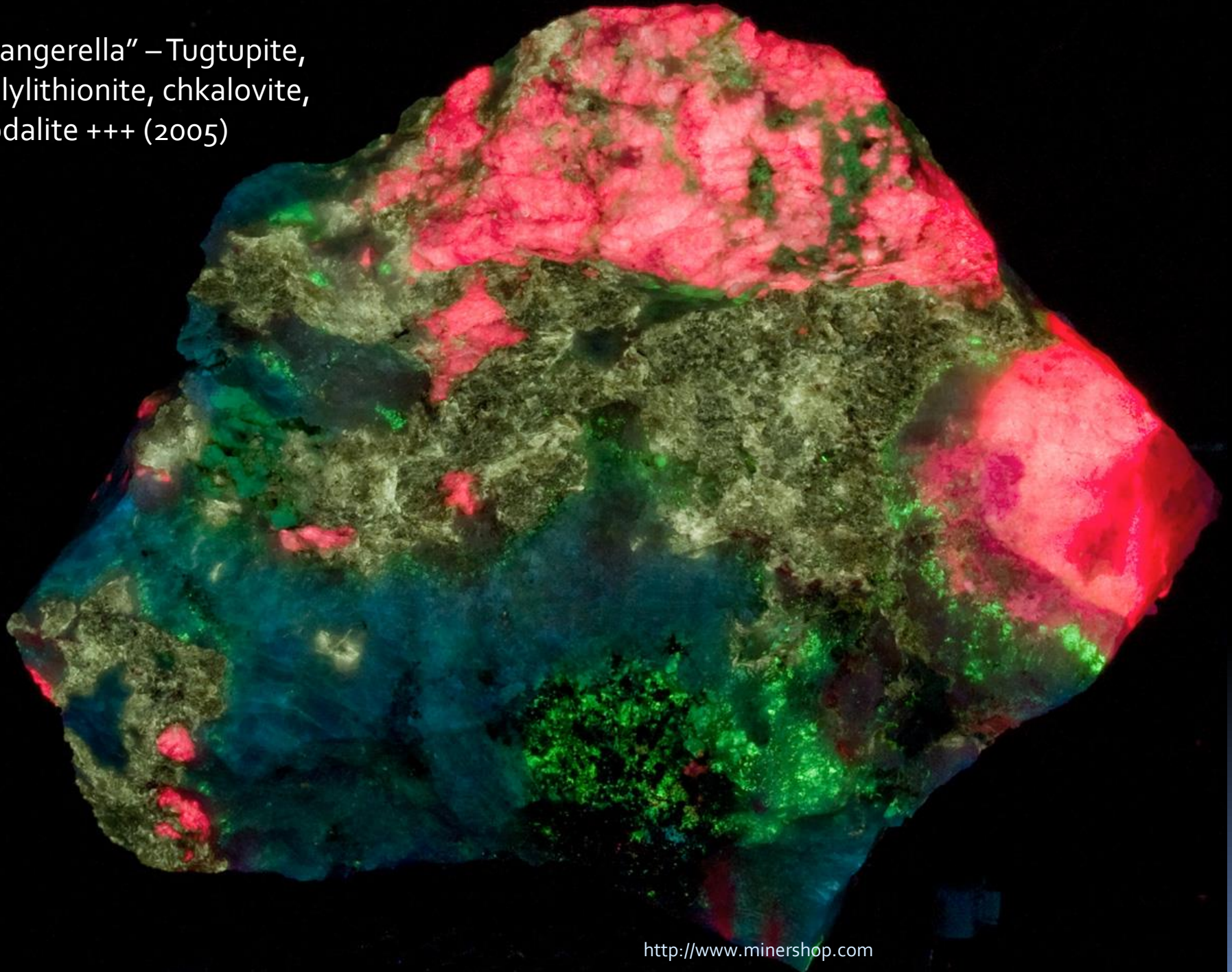
Kangerluarsaq

# Gem Tugtupite Mine



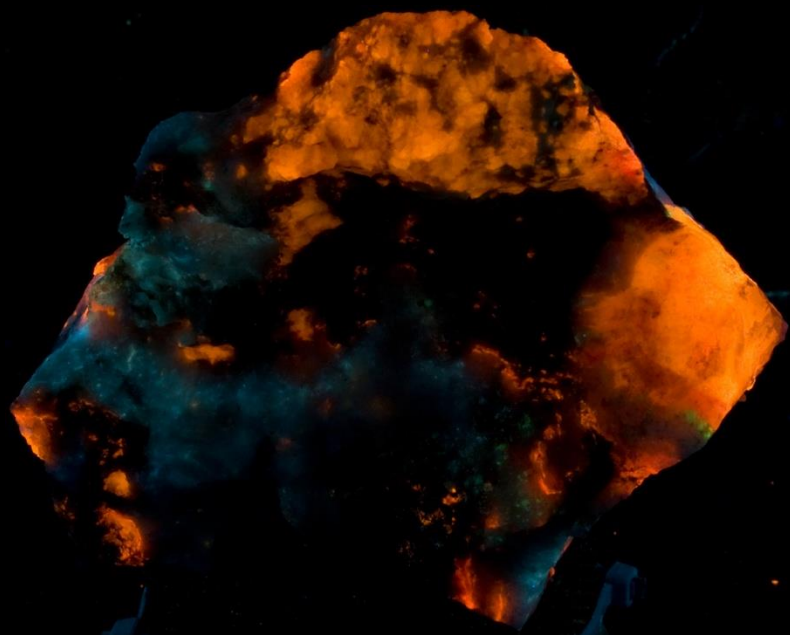
- String of white boulders
- 2005 breadcrumb trail
- 2006 mining
- Source of “Kangerella”

"Kangerella" – Tugtupite,  
Polyolithionite, chkalovite,  
Sodalite +++ (2005)

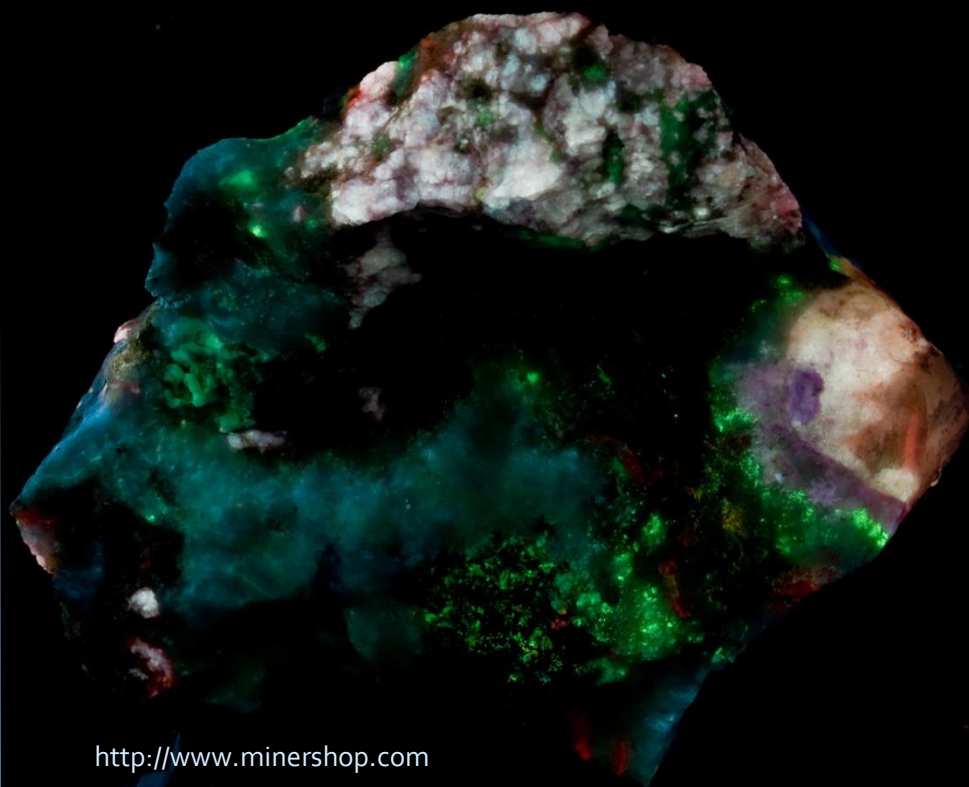




“Kangerella” Longwave



“Kangerella” Midwave



Kangerluarsaq

# Kakortokite Layering

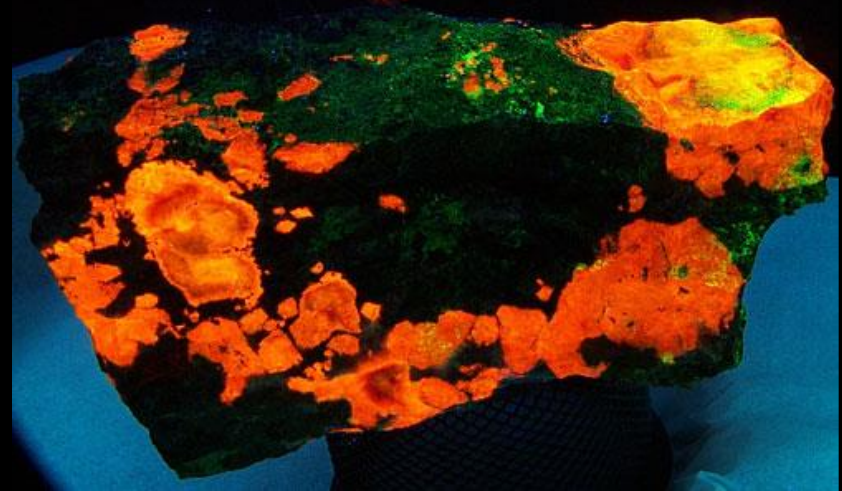


The Kringlerne is a rhythmic sequence of black, red and white layers of Kakortokite. The varying concentrations of the main constituents Arfvedsonite, Alkali-Feldspar and Eudialyte result in the banded appearance of the rock.



Kangerluarsaq

# Green Sodalite (The original find)



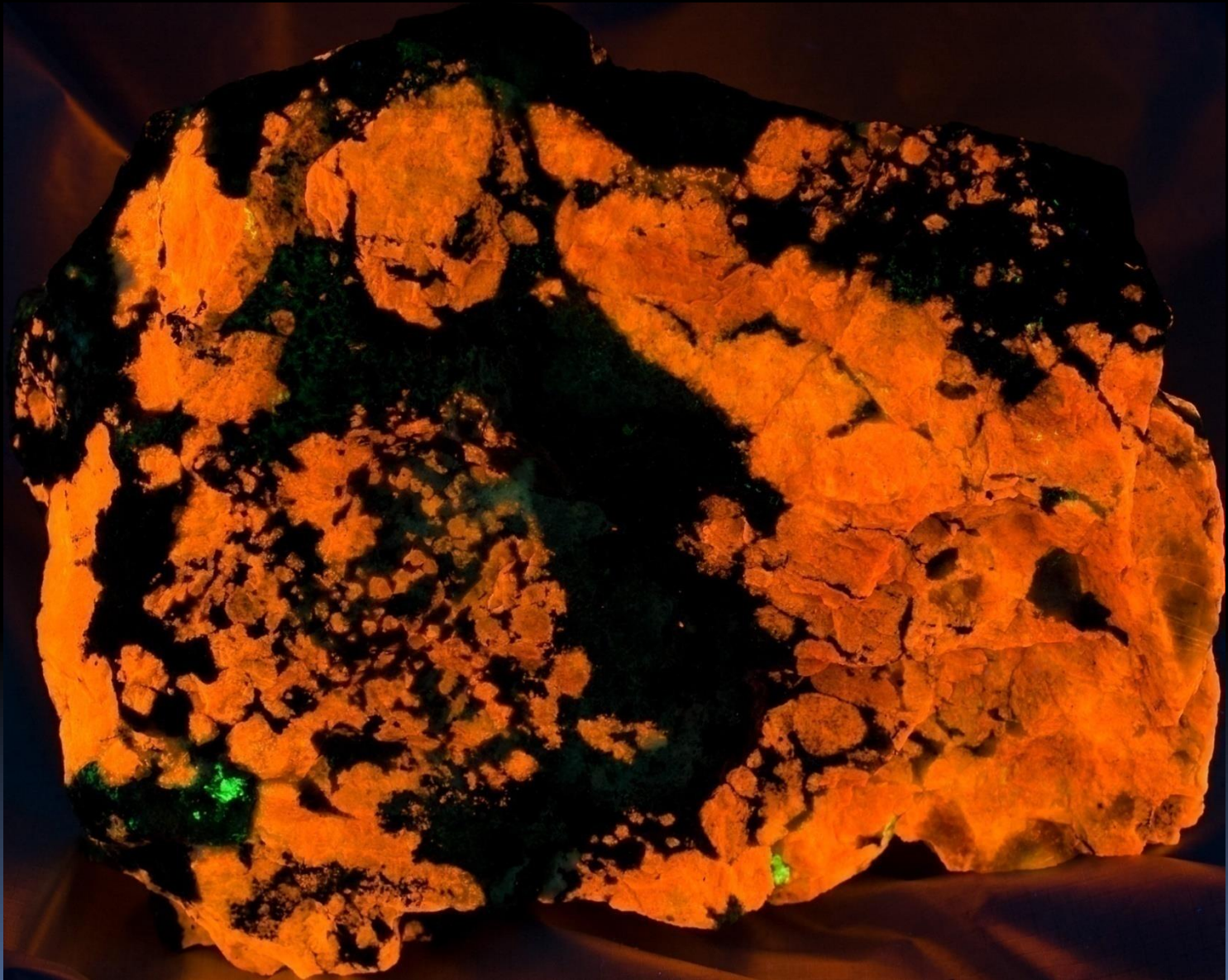


## Green Sodalite (2001)





# Green Sodalite Shortwave/Longwave





# Green Sodalite Tenebrescent





# Scenery Pics - Extras

A collection of pictures around Ilímaussaq, the water, and other scenery



# Mountains and Ice



08 12 2002 15:49



# Kvanefjeld Uranium Mine



# Kvanefjeld Ascent





# The Summit of Kvanefjeld

(Peter, wife and 2 brothers)



# Narsaq from Kvanefjeld





# Searching the Cliffs of TN



# Sodalite Outcrop





# Drilling for a Blast





# Rock Breaking



GL2005 MINERSHOP



# Transition Zone



# Narsaq Elv



Photo courtesy Jim Horste



Photo courtesy Herb Yeates



# Narsaq Elv (no King Kong)



Photo courtesy Don Yonika

# Steam Crossing





# Taseq Slope



# A Day's Haul





# Fresh Water Abounds



# Boat Travel





# Icebergs – up close and personal





# Huge!





# Memories of the Titanic



# Iceberg Graveyard





# An 8 Year Goal Achieved



# Picture Potpourri



Some photos courtesy Lee McIlvaine, Storm Johnson, Herb Yeates