

from the Earth have helped create music.

Mining Makes It Happen!

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# PERCUSSION LU-C"Ab

Percussion instruments produce sound when struck, scraped, or rubbed by hand or a beater, or when shaken. They provide rhythm, as well as melody and harmony.

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LU·C" $\Delta$ b $\sigma$  d< $\Gamma$ \Gammab $\alpha$ ) DC·b) Dα) Ο δαανσίο α) Ο Γα δνανιλσίο. Υδο Ου LDCP. PVLDC97/4PD-

#### TRACK NO. I Drums

Going back to 6000 BCE, drums have been used to communicate, celebrate culture, accompany ceremonies, and prepare for battle.

Drums around the world are made from various materials such as clay, terracotta or various alloys.

The voice of the Creator to North America's Indigenous peoples, the drum  $LL\Delta \cdot PDPA\Delta \cdot \sigma'$ ,  $79V \cdot PA\Delta \cdot \sigma'$ is comprised of wood and animal hide, clay, or metal pots.

Drum kits, featured in orchestral, rock, and jazz music, have shells constructed of wood or metal, including steel, brass, bronze, and aluminum.

# PPa.PPb once 1 LU." Aba)

∇·∩ PՐ∇·ºb⁻ 6000 Cdd"PΔ·) L·4 ρυσο σεΔ·ρ-, LU·"Δδα' ρΔα<ηγα· APLAYL" VOO OU, APL TLULPA, ΔαδογΔ., ΔΓ (Δ.σ., Γα δσδ.γ)

#### TRACK NO.2 Gongs and Bells

Originating in Asia, a gong is a suspended bronze disc that is struck with a mallet. Ancient uses included healing, communication, and calls to meditation and ceremonies. Gongs are now used in orchestras worldwide.

Zhong, or Chinese bells, first made of clay, then bronze, were originally hand struck with a mallet. Suspended bells later evolved. Handbells, usually brass or bronze, come in tuned sets ranging from 25 to 97 bells.

#### PParrby our 2 LUYPba' Fa LUYPboh'

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 $4.2^{\circ}$ ,  $4.7^{\circ}$  LU-17604,  $4.7^{\circ}$   $4.7^{\circ}$ LbU $d\cdot \Lambda d$ ',  $\sigma^{\cap}C^{\circ}$  P<PU" $\Delta b$ '  $\Delta$ 'P<PU" $\Delta b$ ' b $\Delta$ CdJ" $\Delta$ -. b $\sigma$  $\nabla \cdot d\sigma$ C $\cdot$ LUYPba' PAJCCOBad"AA'. bCdJC. LUYPba'. DPDJPbdA. DYA·VA, OSC TPANCAS, VILPAS, COD LAVICASA - 490, 522 Λσυ 97 LU·2 rba'.

# TRACK no.3 Cymbals

Originating in Central Asia, cymbals are thin, plateshaped brass or bronze discs. Long used in religious rituals and to accompany dancers, different cymbals have different sounds, depending on the copper to tin

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# **NEROPHONES** >CLP @>

Aerophones are instruments in which air is the primary vibrating medium used to produce sound.

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#### TRACK no.4 Brass

Brass instruments, or horns, include the buale, trumpet, trombone, French horn, and tuba. Made of brass, or sometimes silver, they are played by pressing the lips to a mouthpiece and blowing, creating a vibration. Valves or slides produce different pitches.

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# WEST FOR I -

TRACK no.5 Woodwinds

Woodwind instruments, originally wood, now use brass and silver, they are played by blowing across or into a mouthpiece. Opening and closing the holes changes the pitch. Woodwinds include the flute, oboe, clarinet, and bassoon.

Among North American Indigenous peoples, flutes and whistles were instruments made from

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reeds, clay, wood, or bone.

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# CHORDOPHONES POPba'

Chordophones produce sound through the vibration of chords, or strings, tightly stretched over a soundboard. Vibration occurs with bowing, plucking, striking, strumming, or blowing the strings.

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# TRACK NO.6 LUTES

Lutes feature strings stretched along a neck and over an enclosed sound chamber, or resonator.

The guitar uses strings of bronze, nickel, nickel-plated steel, or stainless steel wound over a core of steel.

The violin family—including the violin, viola, cello, and bass—use a variety of strings, a metal, gut, or synthetic core wrapped with metals such as aluminum, chrome steel, tungsten, and silver.

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# TRACK NO.7 Harps

Today's triangular frame harp originated in medieval Europe, with strings made of copper and brass. Modern strings could include bronze, steel, nylon, and silver.

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#### TRACK NO.8 LVIES

A strummed instrument, it was important in ancient Babylonia, Egypt, and Greece, and is still played widely in east Africa. Today's lyres feature nylon or steel strings.

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# TRACK no.9 Zithers

Zithers are stringed instruments that can be plucked or struck. The zheng, a plucked zither, is one of China's oldest instruments and the precursor to other Asian instruments.

The piano is a "keyed zither." Both a percussion and string instrument, with 220 to 250 copperwound strings, a piano produces sound through keys that cause hammers to strike the strings.

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# **MUSIC AND ELECTRONICS** boldo Lo Frco.vg

Once only experienced through live performance, recorded music has become widely available via electronic technology, from the phonograph to today's digital files.

 $\Delta V$  PPLPN, PPLLd  $\Delta Q$  DLd  $\Delta Q$   $\Delta Q$   $\Delta Q$   $\Delta Q$  $\Gamma\Gamma$ LLC $\triangleleft$ · $\wedge$ d $^{\prime}$   $b\Delta$  $^{\prime}$ b $^{\prime}$  $^{\prime}$ C $^{\prime}$ D $^{\prime}$ D $^{\prime}$ .

# TRACK no. 10 Phonograph

The phonograph, invented in 1877 by Thomas Edison, played tin foil wrapped or wax cylinders. Ten years later, Emile Berliner patented the gramophone, which played flat disks, or records, made from zinc, hard rubber, or a shellac compound. The gramophone stylus, once steel, now a diamond or corundum needle, rides a record's grooves, picking up the vibrations to be reconverted to sound.

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# TRACK NO.11 Amplifier

The Audion, a vacuum tube that amplified

electrical signals, was invented in 1906. It revolutionized electrical technologies, contributing to telephone, television, movie, and radio innovations. The tube is composed of a combination of glass (quartz sand), tungsten, nickel, barium, strontium, platinum, and /or molybdenum. Starting in the 1960s, transistors, which included semiconductors like germanium and silicon, replaced tube amplifiers.

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# TRACK no. 12 Loudspeaker

Vacuum tube amplifiers enabled the invention of the first electrodynamic speaker. Iron, steel, aluminum, and magnesium can be used for a loudspeaker frame. Aluminum, titanium, or beryllium make up the diaphragm. Copper is used for the wire coil, while neodymium, strontium, or cobalt go into magnets, also used in headphones to generate sound.

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# TRACK no. 13 Radio

A radio is comprised of an antenna, a diode, a tuning coil, amplifiers, and speakers. A radio antenna can be made from copper and iron or aluminum. Early radios used lead crystal or vacuum tube diodes. Modern radio diodes typically use silicon or selenium.

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Δρ. ΦΔ. σΌζΤΟ, ΡΕΝΓΡΩ, ΑΦΡΙΡΩ ΛΑ·Υ, ΡΕΓΦζΡ., ΥΓΥΒΩΡ. LΓΤΟ-<"Δb>, bbΓλΡCb·' Γα bbΓων-ν-ν-'. Λα-Λ' bΓρνΓρυ  $DYA\cdot VA, \sigma_3C \Gamma_0PA\cdot V, \sigma_3C \nabla_4PV, Q_0CC PbDV_0PD \sigma_3CTV-\sigma_3$ ΡΡΓΡΛΓΙΟΝΟ ΙΝΟΥΝΑΡΥ- ΔΥΡ ΔΡΟ ΡΔΙΚΑΡΟΙΟ LPV-Κ"ΔΙΡΑ. ΔΟ Ε ٩١٥ ١٥٥ ١٥٥ ١٥٥ ١٥٥ ١٤٥ ١٤٥ ١٤٥ م ١٤٥ ١٤٥ م ١٤٥ م

# TRACK NO. 14 Cassette Player

In 1928, Fritz Pfleumer made recording on tape possible by adhering iron oxide powder to cellulose film, creating magnetic tape. In 1979, the cassette-based Sony Walkman®, using samarium-cobalt magnets, became the first self-contained portable music system.

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# TRACK NO. 15 CD Player

In 1982, compact discs (CDs) and CD players came on the market. CDs are made of polycarbonate plastic coated with reflective aluminum and protective acrylic. A CD player rotates the CD, which is read by an optical pick-up assembly and reproduces the content. The optical pick-up assembly is generally made from germanium and silicon. Electronic circuit boards incorporate copper components and silicon microchips.

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# TRACK NO. 16 MP3

The MP3 player, offering compressed digital music files, came out in 1998. MP3 players and cellphones were first combined around 2003. High-powered magnets made with rare earth elements neodymium, praseodymium, and dysprosium, along with iron and boron, make speakers vibrate to create sound.

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< ΓΡΓ ΦΡΙΤΡΟ σσρ ρογσρ. να.να, ορ, σενικός ا≥۲۲۸منه و می اما≥۲۵۰م، می اسلام کی ا PDC974, PC9769.



# ₹₽¥С\\

Maanesite

L'ohb/

Strontianite

ילסלחנף<יח

#### **lithium** (Li) Atomic Number: 3

Extracted from the minerals spodumene and lepidolite, lithium is a highly reactive element that efficiently conducts heat and electricity. Lithium is used in rechargeable lithium-ion batteries that power portable electronics.

#### **₹**Δ∩**∀**C (Li) **₫**C**·**Γ\ **₫**PC*ċ*P: 3

ΔL ▷Πσ6UΦ→ ^<∙ΣΓσ ΓΦ ₹ΔΛ⊃₹ΦΗ ΦΥσ6Υ, ⊳Δ∙ ≼∇∪λς ⊲∙CPL ⊲∙Ρ∇∙ΓΡ> Δ⊳υδυλλ∂ΓΡ, Lσ Δυσυδικ. ₹ΔΠλε Δισοςο βρδι δυσυδικώρει 

being beryl and bertrandite. It conducts sound quickly,

it an excellent material for loudspeaker diaphragms.

DV. >><Abc Drlb> aab drob', A9·od· Lbc of>

 $\Delta < -$  PLVLdFD LDCP, PLLQ.QPU, LUCQ., LO  $\Delta P$ 

minerals such as magnesite, dolomite, and serpentine,

and is also extracted from seawater and natural brines.

other metals makes strong, lightweight materials used for

Less dense than aluminum, magnesium alloyed with

loudspeaker frames, cellphones, laptops, and tablets.

L'σγρ Φιλρου ∇Φιληρ ΓΩΠΡι', Γης"Δ σςΔιριου

Ρλυφρη δυρία·>ρ, ισ ρδυλα·ςρσ>ςΓρ, ρα·λ

 $\mathsf{CPCP}, \ \mathsf{QV-} \ \mathsf{PoSP}, \ \mathsf{QV-} \ \mathsf{PoSP}, \ \mathsf{PSP}, \ \mathsf{PSP}$ 

 $V4\cdot V9$ ,  $\Gamma_{\alpha}P7\cdot Ld\Gamma$ P3,  $\Delta^{\sigma}P$ , 4< LLP $\sigma$ 3,  $PDLD^{L}$ LP $\Omega$ B3

۵۲۵۶٬ که، ۲٫۵۲۶٬ ۲۰≼۵۲۶٬ ۲۵ ۲۶۸۶۵۰ ۲۵

<5√√γρΦο, δογορό, βΓΓα βείνου, βείνο≥ Γσ

₽₽८%¤₽₽₽₽₫•, ₫Ч3 Э₽3 >≥₫≤ LФ >≥\≥₫3С2·.

αΛ- βρ<β', Lα- ΓΔΥ βΔΛα<Ε' <Υ∇ιγηβσ'.

Magnerium (Mg) Atomic Number 12

**Beryllium** (Be) Atomic Number 4

>><<a>∆</a> \><<a>∆</a> \<a></a> \<a><



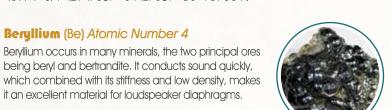
Chromium (Cr) Atomic Number 24

primarily in the mineral chromite. It is tarnish resistant and takes a high polish. Chromium plating gives a hard, polished finish to steel. Audiotapes made with chromium dioxide were the first high fidelity cassettes.

Chromium, a lustrous, hard, steel-grey metal, occurs

#### \>>> L>c (CL) ⊲C·L, ⊲ЪСЧъ 54

ΓΛЬ·ΛΡυδ' Γα Φ·∿γΛΡΥ Β~∽Φ·"ΔΒΟ". '≯ΡΓγο Ρ⊳Γ⊳√ΓЬ∪⊲∘ ΛΩ9∇∙√ΓЬσ۶.



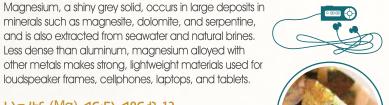
Hematite "ΔLC<sup>></sup>/

#### Iron (Fe) Atomic Number 26

Iron, extracted from the minerals hematite and

#### **Ϥϧ϶ͻ ΛϤ·**Λ' (Fe) **ϤϹ·Γ' Ϥ**ΡϹ*ϲ*ͻ 26

D∆· ⟨¬>> \⟨-√, | D∪\-QP∩ ||D>|C>, Lo ||C, \( C\-)



#### Copper (Cu) Atomic Number 29

Copper, the oldest known metal, occurs in elemental form but is most often extracted from ores like chalcopyrite and chalcocite. Brass and bronze, with high copper content, are used for multiple instruments such as horns, cymbals, gongs, bells, and windings on strings. Copper is used in circuit boards and wire coils in various music electronics.



%d- σCJa"Δb2 dC' <b> ▷\d·Λ' b≤b·Λ≥d>/ Γa ΛΦ·ΛΦΥ ΒΡΓΦΦΡΕΡΟ ΡΟΓΡΟ ΕΓΤΟ-<"ΔΡΦΥΦΑ",



#### Tungsten (W) Atomic Number 74

Tungsten, mostly from the minerals wolframite and scheelite, has high corrosion resistance and the highest melting point of all metals. Applications of tungsten include metal wires, electrodes, and contacts in electronics and lighting. Tungsten goes into the wire filament cathode in a triode vacuum tube, and some stringed instruments have tungsten-wrapped strings.

#### C>`^∩> (W) ⟨C·F` ⟨APC⟨¬> 74

 $DA \cdot DP \cdot VA \cdot V$ ,  $DLP \cdot Deigal, Lo <math>Veq_{\lambda}$ , alop,  $\rho \nabla \cdot$  La-dahar, La  $\rho \nabla \cdot$  La-da-aby. Dr  $\nabla \cdot$  $\mathsf{dCP}'$   $\mathsf{d}'\sigma'$ .  $\mathsf{d}\mathsf{N}\mathsf{D}\mathsf{d}\mathsf{D}\mathsf{D}$   $\mathsf{d}\mathsf{V}$   $\mathsf{d}\mathsf{V}$   $\mathsf{d}\mathsf{D}\mathsf{N}\mathsf{C}\mathsf{D}\mathsf{D}\mathsf{D}$ ΛΦ·Λθγλλ, Δυθυδιγλλί Γα ΦΟΡγί Δυθυδιγλί Γα Ϥ·ሀσbστλίο. Λα∙ΛατλαβΔ∙αίο βΛαβαβυρίο Γα 6999-1999 94009 C2100 C2100 PT.

# Platinum (Pt) Atomic Number 78

Platinum, a silver-white metal, occurs in river deposits and is also produced as a by-product of copper and nickel refining. Platinum is used in triode vacuum tubes and in many electronic applications, such cellphones, MP3 players, video recorders, and computer hard disks.

Alkali metals | Alkaline earth metals | Transition metals | Basic metals | Metalloids | Non-metals 

bdγρ·γρ, γα·ν, (Ы) αC·L, αbCς, 28 **Platinum** ا≼ط∩مٍد

ραγρ·Λρ, Λα·Λ, α·ΛυρΛρ, ΡυΓρ, ρΩυγΛα· ΓΦ ΡΓΡΊΓΟ ΡΙΦΙΝ΄ ΓΦ ΦΕ, ΦΙΝΟΡΘΩΡΝ,  $\mathsf{PDLD} \mathsf{L}_{\mathsf{I}} \nabla \mathsf{C} \cdot \mathsf{D} \Delta \cdot \mathsf{V} \mathsf{d} \cdot \mathsf{V} , \ \, \nabla \mathsf{V} \mathsf{d} < \mathsf{C}_{\mathsf{J}} \ \, \mathsf{PD} \mathsf{LPDD}_{\mathsf{J}}$ V4V47V Lo Lu  $\nabla_{\Lambda}Q\Pi V V$ , PDL49PLP $ba<\Lambda 97$  ) Db  $ba<\Lambda 97$  , Aab ALγσυγγρσ, Lσ ρ<sub>c</sub>ν⊃≥ √ασρσ.

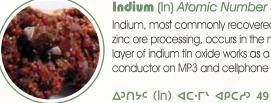


Aluminum, extracted primarily from the rock bauxite, is lightweight, easily shaped, easily machined and cast, and has tremendous corrosion resistance and durability. Its uses related to music production are varied, from snare drum shells, lightweight cases for microphones and MP3 players, and CD reflective surfacing, to bronze alloys, loudspeaker diaphragms, and wrapping for strings.

Bauxite <·\nd>/

סיף (Al) סכיר, סהכים 13

ϤϤϸϧ·ʹ ϷͶϭϧͶ ΔΓ <·៸υϤϧʹ ϤϯϤϷ, ϭͻϷϒϷ϶, Δ·Ϲͻ Lo pt. La pt. Te cp. Te place bolde. 9da) βρυρνυρης ορι Γη·"Υρα, βραφρη, b▷ΓϤϧΓασϤ· Γα ΛΛ9∇·ΥΓbσ\ν, b<<JՐbUΡν ΡϽΓϧϭϒϥϒ, ΡϽΓρϭͽ, Lơ VQ QCϧλ  $aab < 4 \nabla \cdot l \cdot ba$   $b \cap b \cap b \cap b \cap b$   $l a b \cap b \cap b \cap b$ .



Sphalerite

^<≥D≥</

Cassiterite

יל⊳<כ'ר9

Indium (In) Atomic Number 49

Indium, most commonly recovered as a by-product of zinc ore processing, occurs in the mineral sphalerite. A layer of indium tin oxide works as a transparent electrical conductor on MP3 and cellphone touchscreens.

ϤͰσ9Δ·σ', ϧϘΓΓρ, υ<≤⊳≥Ϥ϶, Υ<ρ∀ϧυρη ΛΦ·Λ΄ ΦΡΓΔυσΟΥ-<"Δ9Lb, δουρολί Γσ δοφισί.

Tin (Sn) Atomic Number 50

bor Lldobup.

Tin, a silvery-white metal derived from the mineral cassiterite, is soft, malleable, ductile, and highly crystalline. Alloys of tin are used for soft solder, pewter, and bronze. Bell bronze, used for cymbals, gongs, and bells, has high tin content. A layer of indium tin oxide works as a transparent electrical conductor on MP3 and cellphone touchscreens.

Ον ΛΦ∙Λν βΦ∙ЉΥΛΒν ΡΠΦΒΠ ΦΥΦΒν βΥ⊃≥Φν, ΔL ΔΛϤ<Ο ΦΥΡϤϤΠΦΡΦ, Ϥ<ΥϤ, ΡΡλ...ΦC. b</<>P>d· ααb LU·γγβα', <<<>> Π' Λ</> Λ</> Λ'. ∀b· Γα <<<>> Þ∀·  $\Delta^{\mathsf{U}}\mathsf{U}\mathsf{U}\mathsf{V}\mathsf{C}^{\mathsf{U}}\Delta\mathsf{b}\sigma^{\mathsf{V}}$  PDPboh? For PD $\Delta$ ·oh? bPP LLd\sigma\bU\pa



Quartz

**Silicon** (Si) Atomic Number 14

Silica (silicon dioxide) in various natural forms, includina quartzite, is used to produce silicon ferroalloys and silicon metal. Silicon is a semiconductor and a metalloid, a chemical element with properties between those of typical metals and non-metals. A CD player optical pick-up assembly includes a photodiode made with silicon, and electronic circuit boards incorporate silicon microchips.

#### ר≥∆ס (Si) סכיר סףכר 14

9da) 6ΛΓΛυρί 6 ∇Δ· ϽΡ، ԵϽͺΡσ∨φυ ΕϽͺΓρσ، ΡΣ,ΓΡΠ, Ϥ<C، Υ≤∇φ، ΓΦ ΡΟΛΑΑΠΔΑΕΡ, ΥΑ·ΥΑΡ.



Diamond C>L2/

#### Carbon (C) Atomic Number 6

Diamond, a crystallized form of carbon, is the hardest natural substance. It has extremely high thermal conductivity and low thermal expansion. Diamond needles are used in record players and diamond is used as a heat sink for integrated circuits in electronics because of its high thermal conductivity.

#### ₽>V3 (C) 4C·L, 4bC43 6

~ \$\sigma \sigma \delta \cdot \D \rangle \rang Lσ ∇σ<C> ρ⊳υδηλησηρ, ∇ηθηΔι<"\Ωρσ> Δρ ∇Δ.905Γ ρωΛρ2966ρ.



Sapphire **५८**₹≥

# Corundum (Al<sub>2</sub>O<sub>3</sub>)

The third-hardest mineral, after diamond and moissanite, corundum occurs naturally in igneous rocks such as syenite, nepheline syenite, and pegmatite, and can be synthesized. Typically grey to brown, corundum occurs in other colours; such as red (ruby), and blue (sapphire). Record players often use a corundum stylus. Clear synthetic corundum protects electronic device screens and goes into lasers, used to play CDs and DVDs.

# 6.>4°C (Al2O3)

~σ>d·γ) Γα Jh·σ', DV· b·≥d)CC DPLb) ΓΦ Λ.ΓΟλ. ΕΦ CЬΑΝυΦ 9Cb, 45Φρ. Φ.Λ. Τα ΓΡΠΡΑΦΑΥΡΑ, Τα ΑΓΡΡ aap Δaλργα·, Db Γudr (≥DV), Ta >04.44 (1<4≥). ad. at. a<0+  $\mathsf{PDLP} \mathsf{NLP} \mathsf{DLP} \mathsf{DLP} \mathsf{D} \mathsf{DPP} \mathsf{D} \mathsf{DP} \mathsf{D} \mathsf{DP} \mathsf$ Δα<C> b
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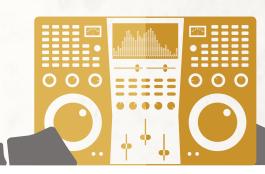
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< Γργρσ, βρυδουθΓρ, γυθΔιγρσγα, Γσ  $b \sqrt{d\sigma} b U P$   $L \sqrt{\sigma} U \sqrt{\Gamma} b \sigma^2$ .

ALBUM

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**6** 





TOP HITS GO 6A24P

magnetite, is one of the most abundant elements on Earth. Nearly all mined iron is used to manufacture steel. Iron oxide powder on cellulose film made up the first magnetic tapes for recording. High-powered permanent magnets used in electronics are made with iron. Some pianos have a cast iron frame to anchor the strings.

 $\nabla \lambda d < C_3 \ P P \lambda L P \Pi, \ V d \cdot V,' \ P b V_P C d \cdot P_P Q P \Pi, \ \nabla \lambda d < C_3$  $\rho\sigma$ LVLd $\Gamma\rho$ , VQ·V,  $\rho$ D\LP $\Omega$ , VUd $\Delta$ · $\Lambda$ L $\rho\sigma$ 3.  $\rho\Gamma_{\alpha}\rho\nabla\cdot\mathcal{A}_{\mathcal{O}}$   $\sigma_{\mathcal{U}}\mathcal{U}_{\mathcal{O}}$   $\nabla\Gamma$   $\nabla_{\alpha}q\Omega\rho$ ,  $\rho_{\mathcal{O}}\mathcal{U}_{\mathcal{O}}$ Prprrbua→ a>>>. au, prrap, blrapha- bolpa,  $d<C_0$   $pq+p\cdot Vp, d_{p>0} \Delta pb, bb, d_0 Vd, Vd, PpVd, PpVd, VpVd, VpVd$ 



Chalcopyrite **し**<▷b·Λ≥**⊲**≻′

# **Strontium** (Sr) Atomic Number 38

dCP<sup>5</sup> bLLdσbU'.

ב'סילי (Mg) לכיר' לאכלי 12 (Mg) ביסילי 12 ביסילי

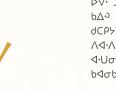
Strontium, found in the minerals celestine and strontianite, is a soft, yellow-tinged silver-white metal that burns in air and reacts with water. Strontium is used in alloys; strontium ferrite permanent magnets are used in loudspeakers and recording media. In an amplifier's triode vacuum tube, strontium carbonates coat a cathode's wire filaments.

#### יי>סיטר (Sr) סכיבי שהכים 38

ην≥Φυρις Σησου Υ≤Φυην Γσ πν≥Σνηρσρι σησοί, **Φ**<sup>2</sup> ΔΥΔ·ΥΦΛΡΥ βΟΥΛΩΡΟ ΛΟΥΝ΄ ΔΩΟ<Ο βΡΛΓΡΟ, <ΛΔ-ΥΓΡΦ3 LΦ VU∂Δ-ΥΓΡΦ3. ΔΡ. LΦ PΓ <ΥΔ∙Υυρα, α<ω υν≥α•υυρε να•ναρν».



Scheelite **√**₹**∀**≯′





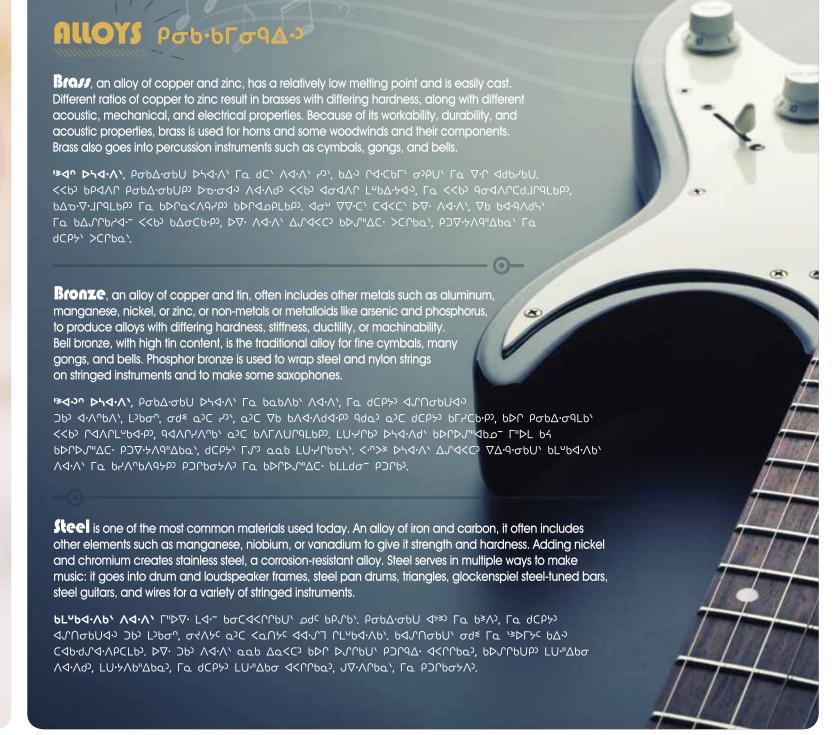


Fifteen lanthanide elements, along with yttrium and scandium, make up the group of rare earth elements (REEs). Generally found together in deposits, REEs are abundant in the Earth's crust but not in large concentrations, so they are difficult to mine. The world's most abundant REE source is bastnäsite. followed by monazite. REEs are usually high-lustre silver, silverywhite, or grey metals.

^b)∩bc, √b an- bcb·p) d"p' bdrlbp) 9da) (REEs). LLΔ·γLbΦ) ρεδρείου ροίσαι REEs αγερώ αιθερείου Δερερείου Δερερείου Δερερείου δερερείου σερερείου σερερερείου σερερείου σερερερείου σερερείου σερερερείου σερερείου σερερερείου σερερείου σερερερείου σερερείου σερερερείου σερερείου σερερερείου σερερείου σερερειου σερερειο σερερειο σερερειο σερερειο σερερειο σερερειο σερερειο σερερειο σερερειο σε  $b\Delta \cdot a\Lambda^ \Gamma^0 C'' \Delta$   $\Gamma^0 A > L^0 PLa + \sigma A \cdot UP$ .  $\Delta \sigma \cdot \sigma A \cdot C''$ bΓσαρ bylbρ REEs ΔσσbU <nCnαγ Γα dC' Jαγγ. DV·  $dr^{3} d^{3} d^{4} d^{5} d^{5} \nabla d^{4} d^{5} d^{7} d$ 

Prazeodymium, Neodymium and Samarium are examples of REEs. Many REEs are used to produce strong and permanent magnets that are used in electronic applications such as headphones, microphones, speakers, and high end pickups for guitars and related musical instruments. REE's are also used

">▼~∩>C, odnc>C Ta hT>A>C TDd Db bbrd- REEs. Llo polado dhao Vlacco pololupa, prapal, la pr bd<C' and  $\Delta'dU\nabla\cdot C''\Delta b'$  bddbU' and Da',  $b<Y\cdot \nabla\cdot YP'$ , bργονιίν Γα υδιγιραί Γα αςδιρ δουρα αςδιραί. ΔL ρα  $\Delta \mathcal{N} < \mathcal{N}$  LPLPS PORTOUP.





Bastnäsite <nCna>1

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**Monazite** Ja57







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