What is Egypt made of?

(Egypt is fairly representative of the composition of an “average” continent.)
The earliest people who we might call ‘geologists’ were those responsible for acquiring Earth materials for society’s use.

Such folks today are called “economic geologists”.

In addition to some smaller-scale mining of other materials, the early Egyptians used various types of stone for building, sculpture, and other types of ornamentation of public works.
Simplified lithologic map of Egypt

- **Towns**
  - A - Alexandria
  - M - Memphis (Giza)
  - S - Syene (Aswan)

- Areas with small basalt deposits
- Areas with loose river, dune or beach sediment deposits
- Limestone with varying amounts of mudstone or shale.
- Sandstone with varying amounts of mudstone or shale.
- Granite and granite-like crystalline rocks.

- Mediterranean
- Libyan Desert
- Nile River
- Red Sea
- Nubia
“Granite”

A piece of granite from the GSW teaching collection.

Notice the coarse crystal size and the fact that most are light in color – pink, white, or gray.

The coin in all pictures is ~2.5cm (1”).
“Granite”

Among non-geologists, “granite” is usually known only as the name of a building stone with a coarse, crystalline texture.

Usually these stones are light in color. To a geologist, all true granite is light in color.

However, in the building trade, “black granite” is well known. This is actually a rock called “gabbro”, or something similar to gabbro.

For now we will use the term “granite” to mean any coarsely crystalline, light-colored rock.

Soon you will have a better definition and can abandon this one.
“Granite”

Most of the “granite” in Egypt is true granite.

The color, in Egypt and everywhere else, ranges from white with or without a few black crystals to pink. Sometimes the pink is very intense.

It was the pink granite that the ancient Egyptians prized most.

Granite is very hard, and of middling density (weight per unit volume).

Its hardness made it difficult to work; it’s distance from Memphis and Thebes made it hard to acquire.

Consequently, granite was used almost exclusively for only the most important statuary, obelisks, building facings, and so forth.

Most of the famous statues of gods and of pharaohs are granite. The obelisk that Napoleon brought to Paris (still standing in Place de la Concorde) is granite. The lower course of facing stones on the great pyramids at Giza (near Memphis) were granite, though higher courses were limestone.
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Libyan Desert

Mediterranean

Nile River

Red Sea

Nubia
Sandstone

A piece of sandstone from the GSW teaching collection.

Notice the granular texture. This is made of sand grains cemented together.

The pink color in this rock is iron oxide stain on the sand grains’ surfaces.
Sandstone

Sandstone is typically very hard and brittle, making it the hardest of rocks to work with.

Consequently, no statues or ornamental objects are sandstone, except a few in the far south carved directly into hillsides.

Sandstone was (and is) used locally as building stone. Blocks were taken from comparatively thin beds and used as bricks when softer, more easily shaped rocks were not available.

Sandstone is about as hard as granite, more brittle (so harder to shape), and not quite so dense. It is usually light in color, though it can get pretty dark gray (or reddish if there’s a lot of iron in it.)
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Limestone

A piece of limestone from the GSW teaching collection.

The platy objects are fossil fragments.

The color of most Egyptian limestone is similar to this, but older limestone in particular can be pretty dark gray.
Limestone

Limestone is common in the walls of the Nile Valley in the most populous parts of the country – then as now.

It is softer than either granite or sandstone, though still very durable, particularly in the dry, desert climate of Egypt. This makes it very easy to quarry and work. I used to cut off excess rock from samples with a small handsaw.

It is also somewhat less dense than either rock, and so easier to transport.

All these things make it the most commonly chosen of building stones.
Limestone

Most of the buildings in Cairo and other modern Egyptian cities are made of limestone. Older ones are made of blocks of the rock, younger ones of concrete, the cement for which is made of limestone.

The great pyramids at Giza were constructed of huge limestone blocks, most weighing over 2 tons. These blocks probably mostly came from Gebel Mokattam, about 10 miles away and completely across the Nile Valley. Except for the lowest courses, where they would show, the facing blocks were also highly polished limestone, a few of which can still be seen near the top of Khafre’s Pyramid (at right). Near the bottom the facing stones were probably granite, brought from Syene.

The Great Sphinx was simply carved out of the limestone bedrock of the Pyramids Plateau. Many other statues are also limestone.
Mudstone and shale

These rocks occur commonly in Egypt as interbeds with both sandstone and limestone. Locally they may actually be more common than the limestone or sandstone.

They are not very durable, so not very useful for anything.

Loose mud (from which these rocks form) were, and still are, fired or sun-baked with straw to make bricks.

Shale has thin layers; mudstone does not.
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**Key Areas**
- Mediterranean
- Libyan Desert
- Nile River
- Red Sea
- Nubia
Loose Modern Sediment

In the interior, most of the loose sediment is either dunes or stream/river sediment, which includes sand, and (in the Nile Valley proper) a considerable amount of mud.

In terms of building material, it has been speculated that the ancients would gradually wall-in a temple as it was being constructed, then infill the site with sand as the walls and columns rose. Thus the workers could always work at “ground level”.

In modern Egypt the sands are used in concrete. As in ancient times the primary use for the river mud is as an amazingly fertile soil in the Nile Valley and Delta, though mud bricks are still made as well.
Along the coasts, both stream (wadi) and beach sediments are common.

In the photograph you can see a flat area at the left (south) end of the coast which has been deposited by streams and the sea. It is mostly sand (and gravel) weathered from the rocks in the background.

The whitish area along the coast to the north of the sand is limestone.

The hilly inland rocks are “granite” and older sedimentary rocks.

Along the Red Sea coast.
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- **Regions**
  - Libyan Desert
  - Mediterranean
  - Nile River
  - Red Sea
  - Nubia
Basalt

A piece of basalt from the GSW teaching collection.

The fine-grained texture and dark color should be obvious.

The light color on the outside is an oxide weathering product of the iron-rich minerals that make the rock so dense.
Almost all the rocks of Egypt are light in color. Here and there, however, we find a black rock called basalt. The same thing could be said of Georgia or Texas or California -- rocks in the continental crust are mostly “granite” and sedimentary rocks like sandstone or limestone and basalt is rare.

The original of the cat at right is made of basalt, and this one either is either made of basalt or of a very convincing synthetic substitute for basalt. Notice that it is very finely textured and black.

Basalt was used in ancient Egypt for small statues such as this and for decorative accents on buildings and other structures. It is a very hard and rather rare rock, and those things mean that it was used only for more important objects.
The microscopic size of its crystals imparts the fine grain to basalt. The tight interlocking of the crystals, which themselves are very hard, gives it its hardness. Thus it is rather hard to work, but produces a finely detailed result in an unusual color.

The minerals in basalt are all quite dense, and their tightly interlocked arrangement means that the rock is also somewhat denser than granite.

Deposits are scattered, though they are more numerous in some places (near Memphis (southern Cairo) and in the Sinai, for example) than in others.
Egypt is made, for the most part, of “granite”, sedimentary rocks (sandstone, limestone, and mudstone), loose sediment (sand and mud), and a little basalt.

<table>
<thead>
<tr>
<th>GRANITE:</th>
<th>SANDSTONE:</th>
<th>LIMESTONE:</th>
<th>BASALT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very hard</td>
<td>Very hard and brittle</td>
<td>Soft</td>
<td>Very hard</td>
</tr>
<tr>
<td>Light color</td>
<td>Light color</td>
<td>Light color</td>
<td>Dark color</td>
</tr>
<tr>
<td>Coarse Crystals</td>
<td>Medium Crystals</td>
<td>Crystals variable</td>
<td>Very Fine Crystals</td>
</tr>
<tr>
<td>Uncommon or inaccessible.</td>
<td>Common</td>
<td>Common in most areas.</td>
<td>Rare.</td>
</tr>
<tr>
<td>Moderately dense: ~2.5-2.9 g/cc</td>
<td>Lower density: ~1.6-2.6 g/cc</td>
<td>Lower density: ~1.5-2.5 g/cc</td>
<td>Very dense: ~3.0 g/cc</td>
</tr>
<tr>
<td>Used in Egypt for construction/decoration of important buildings and statues.</td>
<td>Used in Egypt for construction when limestone was not available.</td>
<td>Used in Egypt for construction of buildings and for statues.</td>
<td>Used in Egypt for decoration of important buildings and for small statues.</td>
</tr>
</tbody>
</table>