

**-I-**

Akhenaten 1-12. (the great hymn to the Aten)

**Miriam Lichtheim** – (from 'Ancient Egyptian Literature  
- A Book of Readings, volume II)

O Ra!  
Splendid you rise in heaven's lightland,  
O living Aten, creator of life!  
When you have dawned in eastern lightland,  
You fill every land with beauty.  
You are beautiful, great, radiant,  
High over every land;  
Your rays embrace the lands,  
To the limit of all that you made.  
Being Ra, you reach their limits,  
You bend them for the son whom you love;  
Though you are far, your rays are on earth,  
Though one sees you, your strides are unseen.

O Ra!  
Sindid reen'en heeven litlân  
O Aten livin cahtor liven!  
Wen donen eesten litlân  
Fillen tootlan biutan.  
Bootun ah, Gootun ah, Radu ah,  
Hagor tootlân tootlân.  
Razen blazen landen  
Tu rahz duzal mudan  
Ra ben reechen Rahzen  
Bendem sundem loavem;  
Thodu far, razen ur;  
Thomen sar, Steeder sinnen un.

**-II-**

**Surya Mantra – Gayatri (1)**

Let us dwell on the lovely splendour of Savitry (Surya)

That he may inspire our minds.

Aum Bhur Bhuva Svah  
Tat Savitur Varenyam  
Bhargo Devasya Dheemahe  
Dhiyo Yo Nah Prachodayat.

**-III-**

The Sun's **mass** is estimated at  $1.989 \times 10^{30}$  Kg ( $10^{27}$  tons) i.e. just under  $2 \times 10^{30}$  Kg.

Zarathustra:

The Sun's mass is estimated at *one point nine hundred eighty nine times ten to the power 30 kilograms.*

"Du grosses Gestirn!

The Sun's **mass** is therefore 332 312 times the mass of the Earth.

Zarathustra:

The sun's mass is therefore *three hundred thirty two thousand three hundred and twelve* times the mass of the earth.

"Du grosses Gestirn!

"Was wäre dein Glück, wenn du nicht hättest welchen du leuchtest!

The Sun's **diameter**, measured at the photosphere, is 1 391 940 km. I.e. 109xEarth's diameter.

Zarathustra:

The Sun's diameter, measured at the photosphere, is *one million three hundred ninety one thousand nine hundred and forty* kilometers.

That is *hundred and nine* times the Earth's diameter.

"Zehn Jahre kamst du hier herauf-zu meiner Höhle.

"Du würdest deines Lichtes und dieses Weges satt geworden sein ohne mich, meine Adler und meiner Schlange.

The **distance** between the Sun and the Earth is 1AU =

The distance between the sun and the earth

150 000 000 km.

is: one astronomical unit, which is: *one hundred and fifty million* kilometers.

Zarathustra: "Du grosses Gestirn!"

Akhenaten 24-44. (Choir + soloists):

O Ra!  
Earth brightens when you dawn in lightland,  
When you shine as Aten of daytime;  
As you dispell the dark,  
As you cast your rays,  
The (two) Lands are in festivity.  
Awake they stand on their feet,  
You have roused them;  
Bodies cleansed, clothed,  
Their arms adore your appearance.  
Trees, herbs are sprouting,  
Birds fly from their nests,  
Their wings greeting your *ka*.  
The entire land sets out to work,  
All beasts browse on their herbs;  
All flocks frisk on their feet,  
All that fly up and alight,  
They live when you dawn for them.  
Ships fare North, fare South as well,  
Roads lie open when you rise;  
The fish in the river dart before you,  
Your rays are in the midst of the sea.

O Ra!  
Ur lumid wen donen litlân  
Wen sheenen's Aten dahten;  
(wen) Dispeller Dahk,  
(wen) Kasteller Rahz,  
Landen festen.  
Ah-wake feeter stan  
Ah-rouset han;  
Bodi pûra, vetûra,  
Armen doran mien.  
Arbor, erbor shoot,  
Avor flienov nesten,  
Wingor geerten *ka*.  
Total-lân toot laborân,  
Toot-anim esvor ebor;  
Toot-offlok rollick feeter,  
Too flien arrûp, allit,  
Liven wen donen ah-them.  
Boaten Norket sail, Surket sail,  
Roden open wendu rain;  
Fishor rivor-rodu hail,  
Razen ben midor u'zain.

#### -IV-

#### Surya Mantra – Gayatri (2)

Let us dwell on the lovely splendour of Savitry (Surya)  
That he may inspire our minds.

Aum Bhur Bhuva Svah  
Tat Savitur Varenyam  
Bhargo Devasya Dheemahe  
Dhiyo Yo Nah Prachodayat.

#### -Va-

**Luminosity** is  $3.85 \times 10^{23}$  kW

The Sun's luminosity is *three point eighty five times ten to the power twenty three* kilowatt.

Effective **temperature** is 5778 K

Its effective temperature is *five thousand seven hundred and seventy eight* degrees Kelvin. [roughly 6000 K]

To be precise:

- Interior Core  $15.6 \times 10^6$  K
- Photosphere 6400 K
- Minimum sunspot 4400 K
- Chromosphere 6000-20 000 K
- Transition region 20 000 – 2 000 000 K

- The temperature at its core is more than fifteen million degrees Kelvin.
- The temperature in the photosphere varies between *six thousand four hundred Kelvin* and *four thousand four hundred Kelvin* – depending on sunspot activity.
- The temperature in the chromosphere varies between *six thousand* and *twenty thousand Kelvin*.
- The transition region varies between

- Coronal large scale structures and holes 1 000 000 – 2 000 000 K

#### Akhenaten 45-62

Who makes seed grow in women,  
Who creates people from sperm;  
Who feeds the son in his mother's womb,  
Who soothes him to still his tears.  
Nurse in the womb,  
Giver of breath,  
To nourish all that he made.  
When he comes from the womb to breathe,  
On the day of his birth,  
You open wide his mouth,  
You supply his needs.

When the chick in the egg speaks in the shell,  
You give him breath within to sustain him;  
When you have made him complete,  
To break out from the egg,  
He comes out from the egg,  
To announce his completion,  
Walking on his legs he comes from it.

#### **Chemical Composition**

91% H - by mass:	71% H
9% He	27% He
0.1% other	2% other

O Ra!

Rotation period is 25-35 days, depending on latitude.  
Equatorial zones slower than higher latitudes.

O Ra!  
How many are your deeds,  
Though hidden from sight,  
O sole God beside whom there is none!

#### **-Vb-**

#### **Zarathustra**

Du Grosses Gestirn!  
Siehe! Ich bin meiner Weisheit überdrüssig, wie die Biene, die des Honigs zuviel gesammelt hat, ich bedarf die Hände, die sich ausstrecken.

Ich möchte verschenken und austeilen, bis die Weisen unter den Menschen ihrer Torheit und die Armen wieder einmal ihres Reichtums froh geworden sind.

*twenty thousand and two million*  
degrees Kelvin.

- Coronal structures can reach temperatures between *one million* and *two million* degrees Kelvin.

U magró sem'en woman,  
U cahtor sempo menses;  
U fedor sont'en muder woom,  
U sooth'on tieren still.  
Noor ten woom,  
Givor Ahtem,  
Nuren tatal mudan.  
Wen comet dawoom ak ahár,  
Dahtenog buren,  
Opener muren,  
Sooplayner nuden.

Wen chick en egg'shell speek,  
Ghiver Ahtem innen ak sustár;  
Wen complaytet,  
Ak brayken eggson,  
Ek sorten eggson,  
Ak annoncetár complaysHEN,  
Ek sorten ambulánt'o leggon.

The sun's chemical composition is:  
Ninety one percent hydrogen - by volume;  
Nine percent helium;  
And the remaining fraction (of a percent) are other elements.

O Ra!

Because of its gaseous nature, the sun rotates at different speeds at different latitudes and varies between twenty five and thirty five days. The equatorial zone is slowest.

O Ra!  
Quantom dahn,  
Hiddom sahn,  
O solar Gott – nah ben noh!

Du Grosses Gestirn!  
Siehe! Ich bin meiner Weisheit überdrüssig, wie die Biene, die des Honigs zuviel gesammelt hat, ich bedarf die Hände, die sich ausstrecken.

Ich möchte verschenken und austeilen, bis die Weisen unter den Menschen ihrer Torheit und die Armen wieder einmal ihres

Dazu muss ich in die Tiefe steigen: wie du des Abends tust, wenn du hinter das Meer gehst und noch der Unterwelt Licht bringst.  
Du überreiches Gestirn!

### **Rotation and magnetic cycles**

Sunspot cycle is 11 years (average)  
Magnetic cycle is 22 years.

Reichtums froh geworden sind.  
Dazu muss ich in die Tiefe steigen: wie du des Abends tust, wenn du hinter das Meer gehst und noch der Unterwelt Licht bringst.  
Du überreiches Gestirn!

Sunspot activity increases and decreases every eleven years.  
The sun's magnetic cycle is twenty two years.

### **-Vc-**

You made the earth as you wished, you alone.  
All people, herds and flocks;  
All upon earth that walk on legs,  
All on high that fly on wings,  
The lands of Khor and Kush,  
The land of Egypt.

You set every man in his place,  
You supply their needs;  
Everyone has his food,  
His lifetime is counted.  
Their tongues differ in speech,  
Their characters likewise;  
Their skins are distinct,  
For you distinguished the peoples.

U ma Ur at wonten, solar U.  
Toot-ôm, toot-urd, toot-offlock;  
Toot Urdom ambuleggon,  
Toot-arrüp wingorof flien,  
Lander af Khor y Kush,  
Aegypt lân.

U planer set toot-man,  
U supplayner nuden;  
Toot-man â food,  
Tid-liven countet.  
Tongor speak differ,  
Carator differ;  
Skinnor distintiv,  
U distinket mensen.

### **Sun's interior.**

Solar interior density is  $148000\text{Kg/m}^3$  i.e. 100 times density of water

Nuclear (proton-proton) reactions synthesizing helium.

Radioactive transfer through radiation zone (2/3 of the sun's radius)

Convection transfer through convection zone (1/3 of sun's radius)

Magnetic fields at surface thought to be generated by dynamo effect in lower convection zone

Solar Wind speed expanding out of corona varies between 300 and 750 km/s

The sun's interior density is thought to be *one hundred forty eight thousand* kilograms per cubic meter, that is: *one hundred* times the density of water.

Nuclear reactions in the core synthesize Helium.

Radioactivity transfers energy through the radiation zone;

Further transfer by convection in convection zone;

Magnetic fields at surface generated by dynamo effect in convection zone;

Solar Winds expand from the corona into solar space at speeds between *three hundred and sevenhundred and fifty* kilometers per second.

### **-Vd-**

You made Hapy (the Nile) in *dat*,  
You bring him when you will,  
To nourish the people,  
For you made them for yourself.

U ma Hâpy en *dat*,  
Bir'in wen wonten,  
Ak Nuren mensen,  
Koz U ma 'them ah-selfor.

Lord of all who toils for them,  
Lord of all lands who shines for them,  
Aten of day-time, great in glory!

All distant lands, you make them live,  
You made a heavenly Hapy (i.e.rain) descend for them;  
He makes waves on the mountains like the sea,  
To drench their fields and their towns.  
How excellent are your ways, O Lord of Eternity!  
A Hapy from heaven for foreign peoples,  
And all lands' creatures that walk on legs,  
For Egypt the Hapy who comes from *dat*.

-Ve-

Distance Earth-Sun is 150 000 000 km = 1AU = just  
under 12000 x Earth's diameter.  
"Practically all the energy the earth receives is that  
which the Sun radiates." (KJHP 314)

Solar **irradiance** is approx. 1353W/m<sup>2</sup> (mean irradiance  
= 1368W/m<sup>2</sup>)

From "The timeless energy of the sun", Madanjeet  
Singh, Unesco World Solar Programme 1996-2005,  
Thames and Hudson – London 1998.

#### **Zarathustra:**

Du Grosses Gestirn!  
Du Überreiches Gestirn! Wohlan!  
Sie schlafen noch, diese höheren Menschen, während  
ich wach bin: das sind nicht meine rechten Gefährten!  
Nicht auf sie warte ich hier in meinen Bergen.  
Zu meinem Werke will ich, zu meinem Tage:  
Aber sie verstehen nicht was die Zeichen meines  
Morgens sind, mein Schritt ist für sie kein Weckruf.  
Mein Adler ist wach und ehrt gleich mir die Sonne.  
Mit Adlers Klauen greift er nach dem Lichte. Ihr sind  
meine rechten Tiere; ich liebe euch.

-Vf-

Your rays nurse all fields,  
When you shine they live, they grow for you;  
You made the season to foster all you made,  
Winter to cool them, heat that they taste you.  
You made the far sky to shine therein,  
To behold all that you made;  
You alone, shining in your form of living Aten,  
**Risen, radiant, distant, near.**

Hir af toot-ôm, ah-them toiler,  
Hir af toot-lân, ah-them sheener,  
Aten dahten, grandiglory!

Toot-lân distân, U ma liv,  
U ma himlen Hapy ah-them dessendér,  
Maket waver at bergan com zain,  
Drinken'ter felder, drinken'ter toner.  
Excellan mannor, O Hir af Evvar!  
Hâpy o'hevven ah-forrin mensen,  
Y crator tootlâns ambuleggon,  
Hâpy comet da *dat* ah-Aegypt.

-Ve-

The distance between Sun and Earth is one  
astronomical unit – that is: hundred and fifty  
million kilometers or nearly twelve thousand  
times the earth's diameter.  
Almost all the energy the earth receives is  
that which the sun radiates.  
Solar irradiance

The Sun is the one source of energy that  
sustains and links all life.  
Solar power is the origin of many forms of  
energy, such as  
Heat; brain and muscle power; fossil fuels;  
Biomass;  
Aero-dynamic, Hydro-electric, Geo-thermal,  
Reflective, Photo-voltaic power.

Rahzen nuren felder,  
Wen sheener livven, ah t'U grover;  
U ma seezon ak foster al mudan,  
Winter ak cooler, Zommer ak teyster U.  
Firmamenten ma ak sheenen,  
Holden al mudan;  
Solar Solar, sheenet format livvin Aten U,  
**Reenan, Radan, Distan, Neran.**

You made millions of forms for yourself alone,  
Towns, villages, fields, the river's course;  
All eyes observe you upon them,  
For you are Aten of daytime on high.  
O Ra!

Million formen solar selfor,  
Toner, hamler, felder, riveran;  
Toot og t'observen them uppon,  
Koz ar Aten dahten tootan Ho.  
O Ra!

**-VI-**

**Surya Mantra - Gayatri (3)**

Let us dwell on the lovely splendour of Savitry (Surya)  
That he may inspire our minds

Aum Bhur Bhuva Svah  
Tat Savitur Varenyam  
Bhargo Devasya Dheemahe  
Dhiyo Yo Nah Prachodayat.

**-VII-**

Akhenaten 13-23

When you set in western lightland  
Earth is in darkness as if in death;  
One sleeps in chambers, heads covered,  
One eye does not see another.  
Were they robbed of their goods  
That are under their heads,  
People would not remark it.  
Every lion comes from its den,  
All the serpents bite;  
Darkness hovers, earth is silent,  
As their maker rests in lightland.

Wen sett'en westen litlân  
Ur en Dahk – com en Doom;  
En kahmen dormet, heddar covet,  
Un og net seeyen alter.  
Weren robet theyren gooder  
Hidden undor heddar,  
Mensen net observen.  
Toot leoner denson apparran,  
Toot serpenter bittan;  
Hover Dahk, Silan Ur,  
Cahtor rest en litlân.