# *Taking a microscopic look at the inner machination of Central Processing Units and what causes them to heat up?*

### ***Introduction:***

As someone who has had to learn how to use a computer in the past two years, I was never really too keen on learning about the machine I was using practically every day. However; that is no longer the case, seeing as I would switch out computer parts and constantly need to adjust settings to get my computer to work. I was curious, what causes my computer to heat up so much? While this question is vast and can potentially have many answers, I would like to focus on the one causing me the most issues. That being the Central Processing Unit.

### ***Goals and expectations:***

The goal of this Technical Description is to give a somewhat basic rundown on the process behind the heat generation of a Central Processing Unit. The intended audience of this Technical description is either High School students who are interested in the inner works of computer components or those who were just as curious as I was.

### ***What is a Central Processing Unit?***

The Central Processing Unit, or CPU for short, serves as the brain of the computer. This component's main function is as follows: Using the instructions that are built into it, it will decode information from the human input and translate that into 1s & 0s, or binary the language of computers. After decoding the information and following the instructions given it will relay the information requested back to the user.

### *What is a CPU comprised of and what does it look like?*

The CPUs of today are made up of silicon, very refined sand that serves as a semiconductor. Semiconductors themselves are just materials that have good electrical conductivity and insulation capabilities. Transistors are also needed and are also made up of silicon semiconductors. Lastly, copper is also used in most of the CPUs that are manufactured and this is to allow proper conductivity. To further give a better image these CPUs are always rectangular,  weigh about 60 grams, and have many tiny pins on the back.

### *Interlude & a brief introduction to the PSU:*

Moving along back to the main concern being presented, why does a CPU produce so much heat? While the processor is very small it has many functions that it must perform and as such it would need lots of electricity to power these processes. To power, this tiny machine will require a Power Supply Unit or PSU. This component serves as the battery to the CPU and transfers the power needed.

## *The actual process of heat generation:*

Now that the processor is functional we can explain how it works. The heat generated from the CPU is a byproduct of using electricity to power it. On the atomic level, there are many electrons, electrodes, and “holes” currently being charged.

1.) These charged electrons and electrodes, also known as electrical carriers, will begin to move through a process of thermal motion, which will begin to generate heat.
    a.) As a result of these charged particles moving and colliding with one another.

2.) The charged particle will then begin to move and bond with negatively charged particles.
    a.) Meanwhile, a “hole” is really an electrical carrier similar to an electron but with opposite polarity.

3.) This in turn makes the current that will relate to the transistors.
    a.) The transistors simply serve to keep track of the current, by amplifying it, blocking it, or opening the current.
        i.) This is accomplished, when an electrical current, passes through the transistor it may resist the material and this will, in turn, create more heat to be generated.

4.) This being said, if the CPU requires more power in order to complete the task being requested more electricity must pass through and as such will generate even more heat.

## *Conclusion:*

In summary, this Technical Description's purpose is the inform those in high school who are interested in Information Technology, or simply those curious as to why computer components run so hot. That being said, due to many innovations in technology CPUs have become a lot smaller than before and a lot more powerful. This can allow us to reasonably expect that the temperatures of modern-day CPUs will be much higher than those before them.

## *Work used as a form of reference:*

**Michael E Levinshtein, and Grigory S Simin. Transistors: From Crystals To Integrated Circuits. World Scientific, 1998. EBSCOhost, https://search-ebscohost-com.ccny-proxy1.libr.ccny.cuny.edu/login.aspx?direct=true&db=e000xna&AN=65768&site=ehost-live**