RAPID INTERPRETATION OF EKG's

Dr. Dubin's classic, simplified methodology for understanding EKG's

Dale Dubin, MD

RAPID INTERPRETATION OF EKG's

... an interactive course

by

Dale Dubin, MD

Rapid Interpretation of EKG's

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International Availability of *Rapid Interpretation of EKG's*

Rapid Interpretation of EKG's has been the international best seller for over fifty years. It is printed in 46 foreign language editions, which are available through publishers in most countries.

Our internet sites provide valuable, practical information on electrocardiography and cardiac monitors. Specific presentations are designed for each of three medical disciplines on the internet web sites.

The English edition of *Rapid Interpretation of EKG's*, now updated with each printing, is available internationally through the internet. Our three internet sites provide efficient book fulfillment to any location worldwide. Books can be ordered from any country with a major credit card. The internet sites provide foreign currency conversion information for instant value determination in all mediums of exchange.

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Emergency medical personnel: **www.EmergencyEKG.com**

Ion Adventure in the Heartland: **www.IonAdventure.com**

Dedication

To those from whom I have learned:

Dr. George C. Griffith
Dr. Willard J. Zinn
Dr. Henry J. L. Marriott
Dr. Charles Fish
Dr. Suzanne Knoeble
Dr. William L. Martz
Dr. Nathan Marcus
Dr. Richard G. Connar
Dr. Jose Dominguez
Dr. Louis Cimino
Dr. David Baumann
Dr. Dale Dubin

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With humility and gratitude, I acknowledge my indebtedness:

To God for the inspiration and for my persistent survival in spite of deadly warning shots. I do understand.

To all my mentors from whom I have learned principles of electrocardiography.

To all my family, living and deceased.

To my computer graphics guru Paul Heinrich, whose knowledge of computer science and graphic artistry made this 6th edition a beautiful reality.

And to my publisher, COVER Publishing Company, for their great understanding and cooperation. My association with the publisher represents the closest possible concert between author and publisher.

Some computer graphic illustrations utilize portions of *LifeART* clip art.

Table of Contents

Since this book will be your lifetime reference, you should place an identifying tab on the first page of each chapter.*

Congratulations!

You are joining a coterie of knowledgeable medical professionals. *Rapid Interpretation of EKG's*, for over forty-five years the best seller in the US, has also educated millions of people around the world in 46 foreign languages.

Updated and refined with each of seventy printings, this classic text is now the most current and most referenced medical resource in the field.

But, for the understanding that is vital to your future, your personal success depends on certain subtle instructions in the book.

If advised to:

- "Review certain previous illustrations"... Do it! There's an important reason.
- "Place index tabs on certain pages"... This is necessary for your understanding.
- "Return to reread a specific page"... Respond willingly, without hesitation.
- "Study a chapter's summary *before* reading the chapter"... Preview it.

Your commitment to these details will reward you with **understanding** that ensures a lifetime of practical **knowledge**.

about sharing your knowledge...

My most sincere thanks to those persons, worldwide, who continue to send EKG tracings*. I am truly grateful. However, the number of people donating tracings has grown exponentially, making the publication of their names (as I've done previously) virtually impossible.

All of you will observe both classical and unusual tracings that should be preserved (use a copier, because EKG tracings tend to fade with time) for teaching purposes. Sharing this very special knowledge with others is a time-honored medical tradition.

This spirit of unselfish sharing of your knowledge continues to improve the level of care in this crucial medical discipline.

—DD

* I enthusiastically collect and study 12 lead EKG's, strips of classical and unusual tracings, and even those rolls of "code" tracings that are usually discarded. They may be sent to me via the publisher, COVER, Inc., P.O. Box 07037, Fort Myers, FL 33919. I regret that I cannot acknowledge all tracings. This rescued trash is an invaluable treasured resource; please know that it is appreciated!

"To make a great dream come true, the first requirement is a great capacity to dream; the second is persistence – a faith in the dream."

Hans Selye, MD

Most teachers are knowledgable.
Good teachers are intelligent.
Great teachers are patient.
Exceptional teachers are students themselves.

D.D.

Before you begin…

First, read the caption and associate it with the simplified illustration.

Master the concept. Your comprehension is important.

Then, carefully read the interactive text, filling in each blank as you go.

- If you need to return to the illustration, that's even better… because each time you review an illustration, the visual image becomes more indelibly impressed in your memory.
- Interactive (programmed) instruction assures UNDERSTANDING by employing visual imagery to explain and link important concepts. Understanding is the key to lasting knowledge…

… and it's enjoyable because it is entertaining audience participation. You are the audience, and I'm right here with you, highlighting your progress with helpful "Notes."

Let's have some fun!

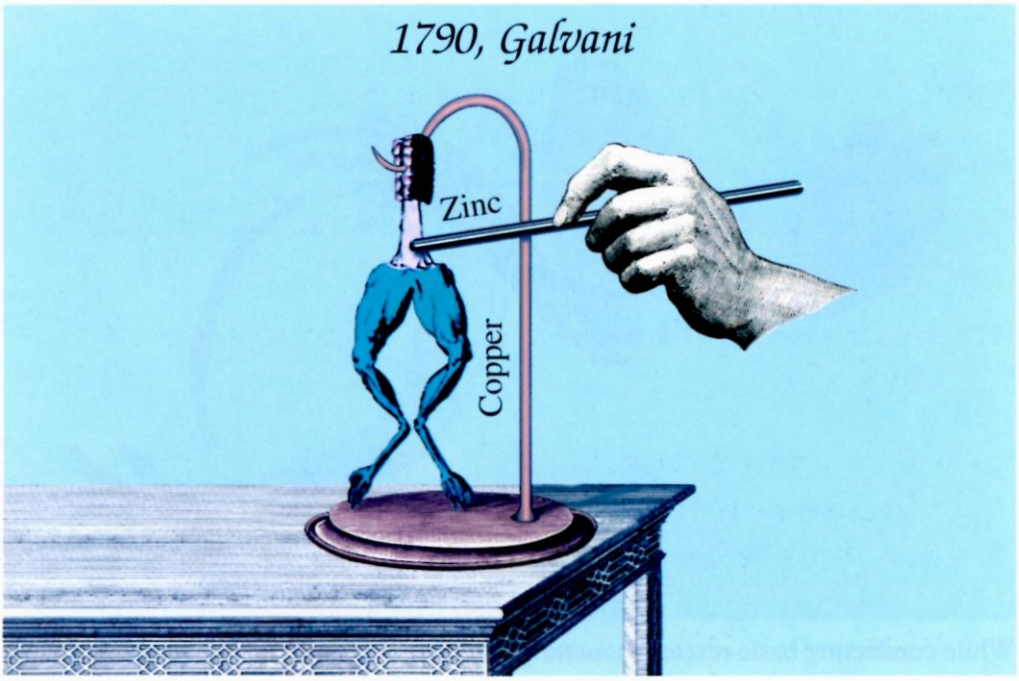
"Lasting knowledge results from understanding."

Happy Learning,

Dale Dubin

Dale Dubin, MD

Chapter 1: Basic Principles



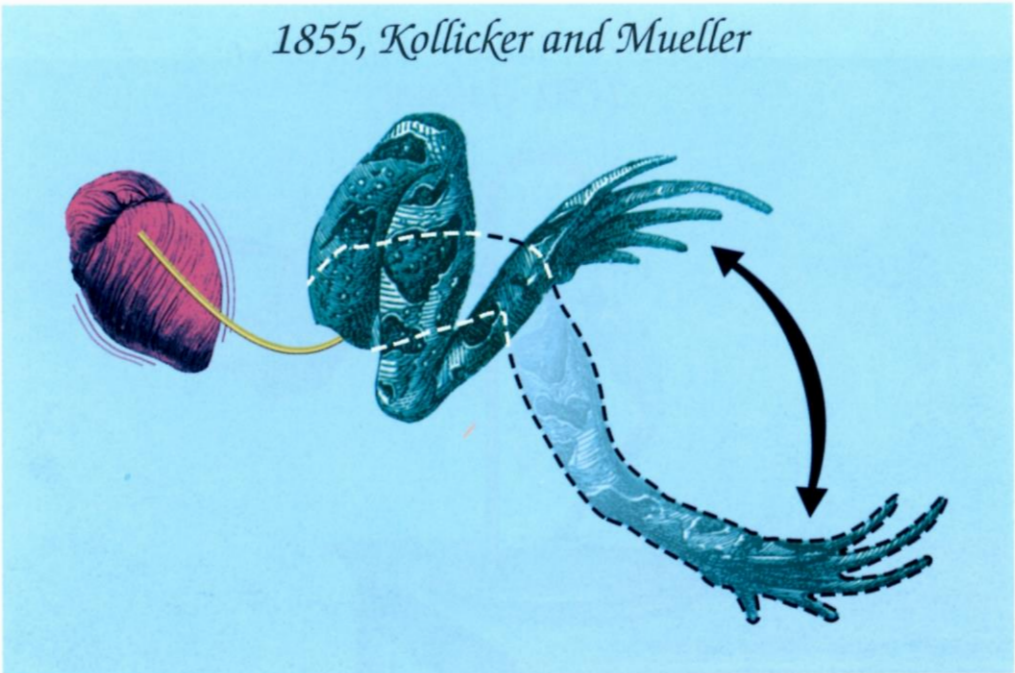
In 1790, an audience of usually sedate scientists gasped in disbelief as Luigi Galvani, with a flare of showmanship, made a dead frog's legs dance by electrical stimulation.

Galvani knew that completing a circuit connecting dissimilar metals to the legs of a recently deceased frog would create a stimulating _____ current. electrical

The resulting electrical current would stimulate the frog's legs to jump, and with repeated stimuli he could make them _____. dance

Note: But in those times, bringing a dead frog "back to life" was a shocking and ghastly "supernatural" feat. (And Galvani loved it!)*

* Get yourself a warm cup of coffee, relax and enjoy… the rest is just as easy and entertaining.

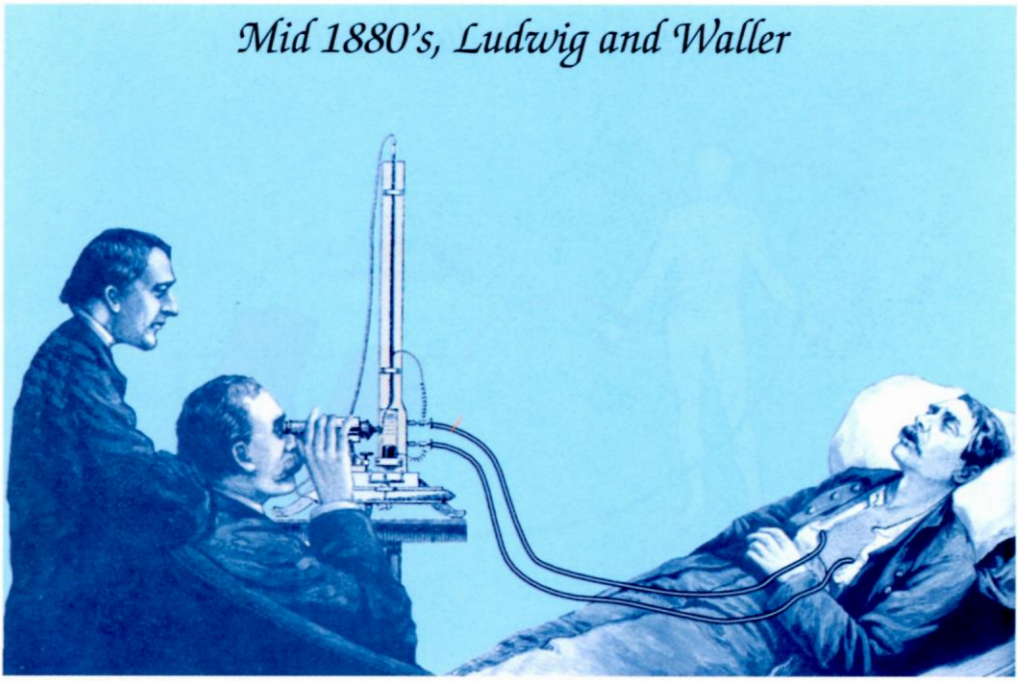


While conducting basic research around 1855, Kollicker and Mueller found that when a motor nerve to a frog's leg was laid over its isolated beating heart, the leg kicked with each heartbeat.

"Eureka!" they thought, "the same electrical stimulus that causes a frog's leg to kick must cause the heart to _____." beat

So it was logical for them to assume that the beating of the heart must be due to a rhythmic discharge of _____ stimuli. electrical

Note: And thus an association between the rhythmic pumping of the heart and electrical phenomena was scientifically established. Very basic and very important.



Capillary electrometer courtesy of Bakken Library

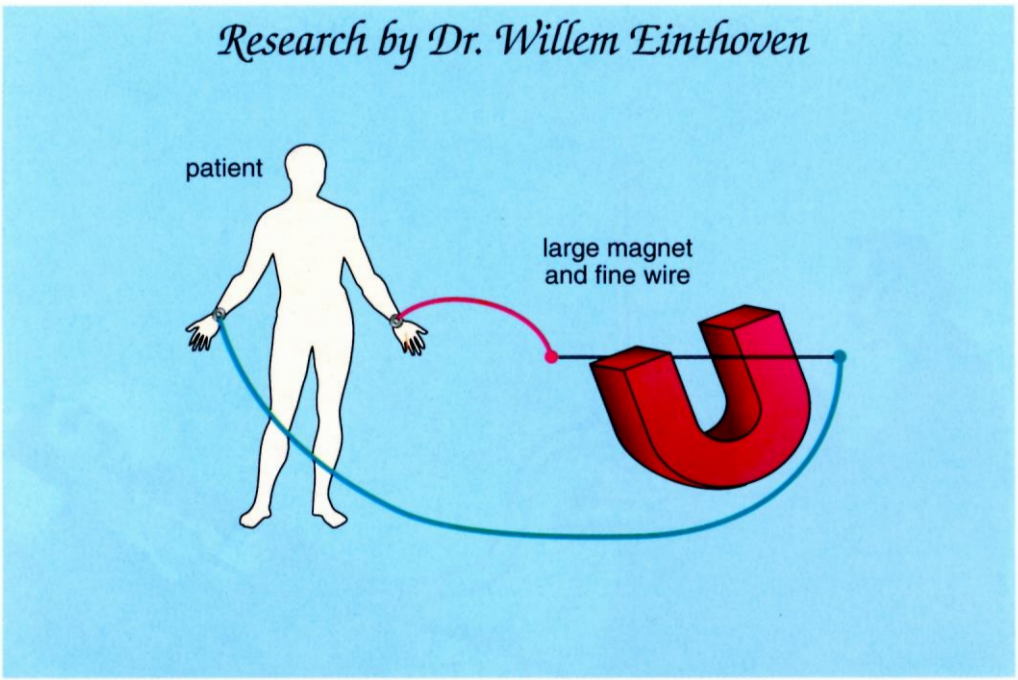
In the mid 1880's, while using a "capillary electrometer," Ludwig and Waller discovered that the heart's rhythmic electrical stimuli could be monitored from a person's skin.

This apparatus consisted of sensor electrodes that were placed on a man's _____ and connected to a Lippman capillary electrometer, which used a capillary tube in an electric field to detect faint electrical activity. skin

The fluid level in the capillary tube moved with the rhythm of the subject's _____-beat… very interesting. heart

This apparatus was a little too unsophisticated for clinical application, or even for economic exploitation, but it was _____ interesting. very

Note: This momentous achievement opened the door for recording the heart's electrical activity from skin surfaces.

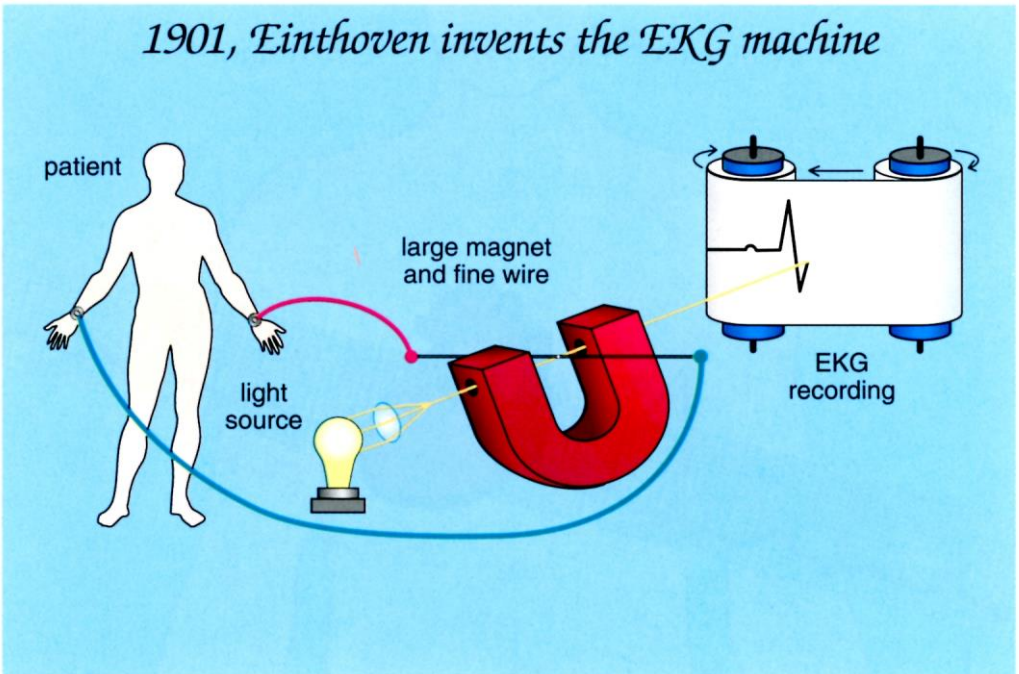


Enter Dr. Willem Einthoven, a brilliant scientist who suspended a silvered wire between the poles of a magnet.

Two skin sensors (electrodes) placed on a man were then connected to the ends of the silvered wire, which ran between the two poles of the _____. magnet

The silvered _____ (in the magnetic field) twitched to the rhythm of the subject's heartbeat. wire

This was also very interesting, but _____ wanted a timed record. Einthoven



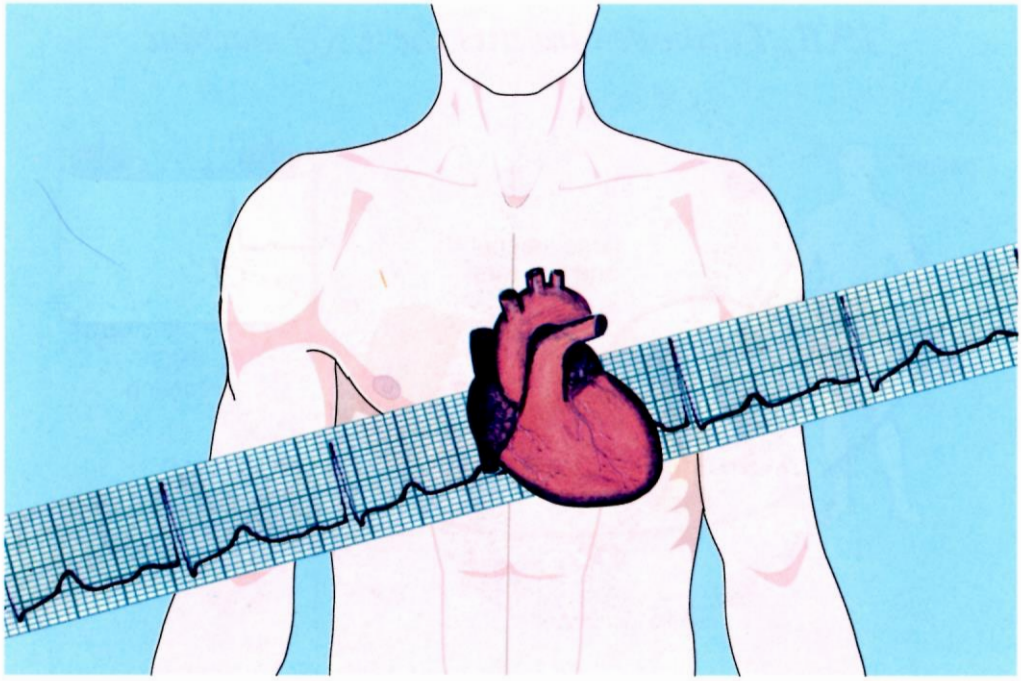
So Einthoven projected a tiny light beam through holes in the magnet's poles, across the twitching silvered wire. The wire's rhythmic movements were recorded as *waves* (that he named P, QRS, and T) on a moving scroll of photographic paper.

Very clever, that Einthoven! The _____ movements of the wire (representing the heartbeat) created a bouncing shadow… rhythmic

… that was recorded as a _____ series of distinct waves in repeating cycles. rhythmic

He named the waves of each cycle (alphabetically) P, QRS, and ____. T

Note: "Now," thought the clever Einthoven, "we can record a heart's *abnormal* electrical activity… and compare it to the normal." And thus a great diagnostic tool, his "electrokardiogram" (**E**lectro**K**ardio**G**ram), evolved around 1901. Let's see how it works…



The **electrocardiogram** (EKG) records the electrical activity of the heart, providing a record of cardiac electrical activity, as well as valuable information about the heart's function and structure.

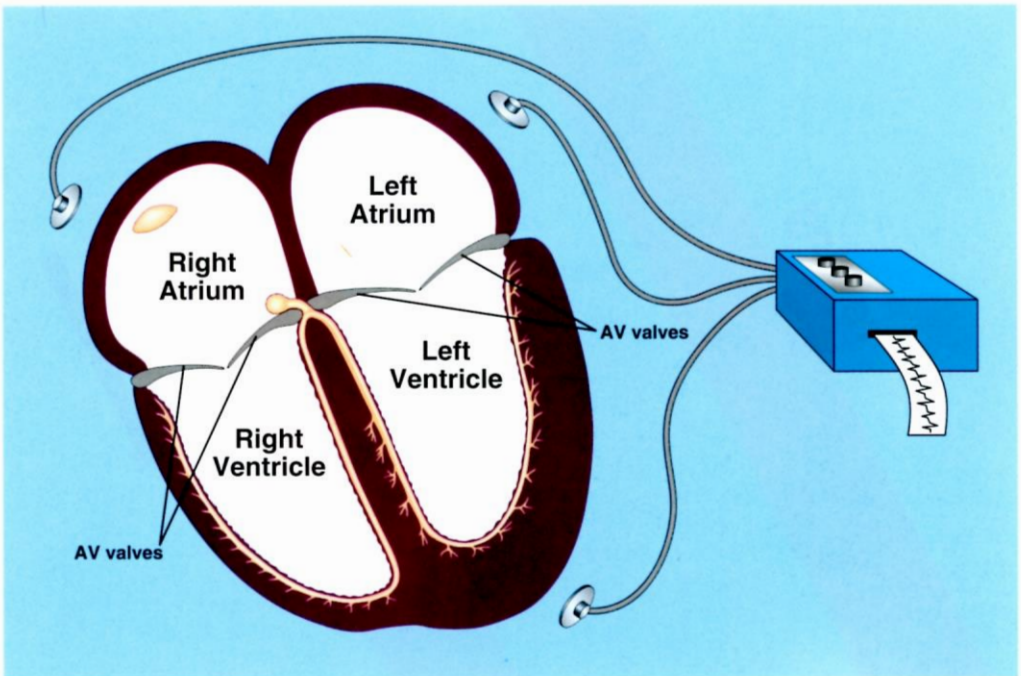
The electrocardiogram is known by the three letters _____; it provides us with a record of cardiac electrical activity and valuable information about the heart's function and structure.

EKG

Note: Since the time of Einthoven's "electrokardiogram," the medical profession has used the letters EKG to represent the electrocardiogram. Some say that "ECG" is more correct, and you may see it used in some texts. However, Medicine honors tradition, and EKG has been used for years. Also, ECG sounds like EEG (the brain wave recording), and this can cause misunderstanding and confusion.

The EKG is inscribed on a ruled paper strip that gives us a permanent _____ of cardiac activity and the health status of the heart. Cardiac monitors and cardiac telemetry provide the same information in real time.

record



The EKG records the electrical activity of contraction of the heart muscle ("myocardium").

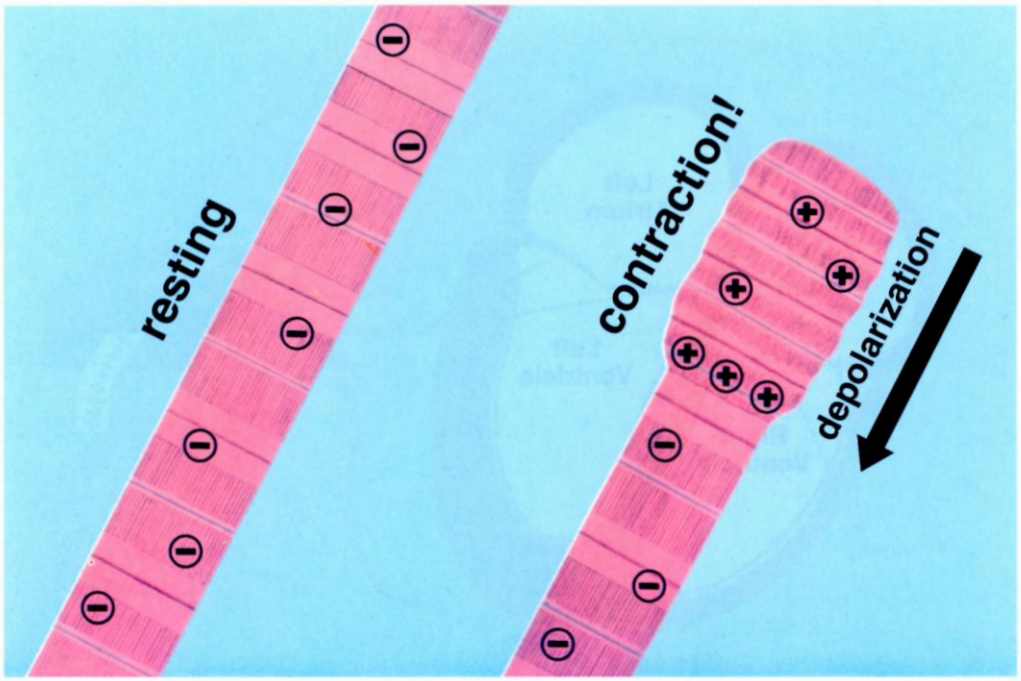
The information recorded on the EKG represents the heart's _____ activity. electrical

Most of the information on the EKG represents electrical activity of _____ of the myocardium. contraction

Note: The EKG also yields valuable information about the heart's rate and rhythm.

When the myocardium (*cardium* = heart, *myo* = muscle) is electrically stimulated, it _____. contracts

Note: This illustration is intended to familiarize you with the simplified cross-section of the heart and the (closed) AV valves. The chambers are identified, and you should know them, for this diagram will be used often.



The interiors of heart muscle cells (myocytes*) are negative ("polarized") at rest, but when "depolarized" their interiors become positive and the myocytes contract.

While in the resting state, myocytes are *polarized*, the interior of every cell being _____-ly charged. negative

Note: In the strictest sense, a resting polarized cell has a negatively charged interior and a positively charged outside surface, but for simplicity we will consider only the negative interior.

The interiors of resting myocytes are negative, but when these cells are *depolarized*, their interiors become _____ and the cells contract. positive

"Depolarization" moves as a wave through the myocardium. As this wave of **depolarization** stimulates the heart's myocytes, they become positive and _____. contract

* Just as the heart muscle is called the *myocardium*, its cells are called "myocytes".