

CLASS 6

I. Studying neuroscience helps us fulfill our responsibilities as Jews.

A. SLEEP

B. DREAMS

C. LEARNING AND MEMORY

II. Understanding neurological functioning helps us become better people

A. Children and brain development

B. Adults and brain development

III. Neuroscience and Neshamah

A. The brain apart from the “me”

B. The brain as the “residence” for the *neshamah*

C. Primary human activity and the goal of our lives is rooted in the use of the mind

IV. The Brain in the Torah

A. Where is the word *מחשבה* mentioned explicitly in the Torah?

Iyov 21:24

עֲטִינֵיו מְלֵאוֹ חֵלֶב וּמִחַ עֲצֻמוֹתָיו יִשְׁקָה.

His pails are full of milk, and the marrow of his bones is moist.

B. To what part(s) of the body does the Torah attribute thoughts and emotions?

1. The Heart

a. Thought – sampling of verses:

(1) וַיֵּרָא ה' כִּי רַבָּה רָעַת הָאָדָם בָּאָרֶץ וְכָל יַצָּר מִחֲשֹׁבֶת לִבּוֹ רָק רָע כָּל הַיּוֹם.
(בראשית ו:ה)

And the Lord saw that the evil of man was great in the earth, and every imagination of his heart was only evil all the time.

(2) וּאִתָּה תִּדְבֹר אֶל כָּל חֲכָמֵי לֵב אֲשֶׁר מִלֵּאֲתֵינוּ רוּחַ חֲכָמָה וְעָשׂוּ אֶת בְּגֵדֵי אֶהָרָן לְקַדְּשׁוֹ לְכַהֵנוּ לִי. (שמות כח:ג)

And you shall speak to all the wise hearted, whom I have filled with the spirit of wisdom, and they shall make Aaron's garments to sanctify him, [so] that he serve Me [as a kohen].

(3) וְכָל חָכָם לֵב בְּכֶם יָבֹאוּ וַיַּעֲשׂוּ אֶת כָּל אֲשֶׁר צִוִּיתִי. (שמות לה:י)
And every wise hearted person among you shall come and make everything that the Lord has commanded.

(4) וְכָל אִשָּׁה חַכְמַת לֵב בְּיָדֶיהָ טוּוּ וַיָּבִיאוּ מִטּוֹה אֶת הַתְּכֵלֶת וְאֶת הָאַרְגָּמָן אֶת תּוֹלַעַת הַשָּׁנִי וְאֶת הַשֵּׁשׁ. (שמות לה:כה)
And every wise hearted woman spun with her hands, and they brought spun material: blue, purple, and crimson wool, and linen.

(5) וַיֵּדַעַת הַיּוֹם וְהִשְׁבַּתְתִּי אֶל לִבְבְּךָ כִּי יְהוָה הוּא הָאֱלֹהִים בְּשָׁמַיִם מִמַּעַל וְעַל הָאָרֶץ מִתַּחַת אֵין עוֹד. (דברים ד:לט)
And you shall know this day and consider it in your heart, that the Lord He is God in heaven above, and upon the earth below; there is none else.

(6) וְנָתַתְתָּ לְעַבְדְּךָ לֵב שֹׁמֵעַ לְשִׁפְטֵי אֶת עַמְּךָ לְהַבִּין בֵּין טוֹב לְרָע כִּי מִי יוּכַל לְשִׁפֵּט אֶת עַמְּךָ הַקָּבֵד הַזֶּה. (מלכים א ג:ט)
Give (therefore) Your servant an understanding heart to judge Your people, that I may discern between good and bad; for who is able to judge this Your great people?

(7) וַיִּתֵּן אֱלֹהִים חֲכָמָה לְשִׁלְמֹה וַתְּבוֹנָה חַרְבָּה מְאֹד וְרוּחַ לֵב כַּחֲוֹל אֲשֶׁר עַל שְׂפַת הַיָּם. (מלכים א ה:ט)
And God gave Solomon wisdom and understanding exceedingly much, and largeness of heart, as the sand that (is) on the seashore.

(8) וְכָל הָאָרֶץ מְבַקְשִׁים אֶת פְּנֵי שְׁלֹמֹה לְשִׁמֹּעַ אֶת חֲכָמָתוֹ אֲשֶׁר נָתַן אֱלֹהִים בְּלִבּוֹ. (מלכים א י:כד)
And all the [inhabitants of] the earth sought Solomon's presence to hear the wisdom with which God had endowed him.

(9) שְׁמַעוּ אֵלַי יְדַעִי צְדָק עִם תּוֹרַתִי בְּלִבָּם אֵל תִּירְאוּ חֲרַפַּת אָנוּשׁ וּמַגְדַּפְתֶּם אֵל תִּחַתּוּ. (ישעיהו נא:ז)
Hearken to Me, you who know righteousness, a people that has My Torah in their heart, fear not reproach of man, and from their revilings be not dismayed.

(10) עֲצַת ה' לְעוֹלָם תִּעֲמֹד מִחֲשָׁבוֹת לִבּוֹ לְדוֹר וָדוֹר. (תהלים לג:יא)
The counsel of the Lord shall endure forever; the plans of His heart to all generations.

(11) רַבּוֹת מִחֲשָׁבוֹת בְּלֵב אִישׁ וְעֲצַת ה' הִיא תִקּוּם. (משלי יט:כא)
There are many thoughts in a man's heart, but God's plan-that shall stand.

(12) בְּנִי אִם חָכָם לָבָךְ יִשְׂמַח לִבִּי גַם אָנִי. (משלי כג:טו)
My son, if your heart has grown wise, my heart too will rejoice.

b. Emotion

(1) וַיִּנְחַם יְהוָה כִּי עָשָׂה אֶת הָאָדָם בְּאָרֶץ וַיִּתְעַצֵּב אֶל לְבוֹ. (בראשית ו:ו)
And the Lord regretted that He had made man upon the earth,
and He became grieved in His heart.

(2) וַיֹּאמֶר אֶל אָחָיו הַיּוֹשֵׁב כְּסָפִי וְגַם הִנֵּה בָאִמְתַּחְתִּי וַיֵּצֵא לִבָּם וַיִּחְרְדוּ אִישׁ אֶל
אָחָיו לֵאמֹר מַה זֹאת עָשָׂה אֱלֹהִים לָנוּ. (בראשית מב:כח)
And he said to his brothers, "My money has been returned, and
indeed, here it is in my sack!" Their hearts sank, and trembling,
they turned to one another, saying, "What is this that God has
done to us?"

(3) וַיִּחַר אַף יְהוָה בְּמֹשֶׁה וַיֹּאמֶר הֲלֹא אֶהְרֵן אָחִיךָ הַלֵּוִי יִדְעָתִי כִּי דָבָר יִדְבֹר
הוּא וְגַם הִנֵּה הוּא יֵצֵא לְקִרְאֲתְךָ וְרֹאֶךָ וְשָׁמַח בְּלִבּוֹ. (שמות ד:יד)
And the Lord's wrath was kindled against Moses, and He said,
"Is there not Aaron your brother, the Levite? I know that he will
surely speak, and behold, he is coming forth toward you, and
when he sees you, he will rejoice in his heart.

(4) וַיִּכְבַּד פַּרְעֹה אֶת לְבוֹ גַם בַּפֶּעַם הַזֹּאת וְלֹא שָׁלַח אֶת הָעָם. (שמות ח:כח)
But Pharaoh hardened his heart this time also, and he did not
let the people go.

(5) דַּבֵּר אֶל בְּנֵי יִשְׂרָאֵל וַיִּקְחוּ לִי תְרוּמָה מֵאֵת כָּל אִישׁ אֲשֶׁר יִדְבְּנוּ לְבוֹ תִקְחוּ
אֶת תְּרוּמָתִי. (שמות כה:ב)
Speak to the children of Israel, and have them take for Me an
offering; from every person whose heart inspires him to
generosity, you shall take My offering.

(6) לֹא תִשָּׂא אֶת אָחִיךָ בְּלִבְבְּךָ הוֹכֵחַ תּוֹכִיחַ אֶת עַמִּיתְךָ וְלֹא תִשָּׂא עָלָיו חֵטָא.
(ויקרא יט:יז)
You shall not hate your brother in your heart. You shall surely
rebuke your fellow, but you shall not bear a sin on his account.

(7) וּבְגוֹיִם הֵהֱם לֹא תִרְגִּיעַ וְלֹא יִהְיֶה מְנוּחַ לְכַף רַגְלְךָ וְנָתַן יְהוָה לְךָ שֵׁם לֵב
רָגַז וְכִלְיוֹן עֵינָיִם וְדָאָבוֹן נַפְשׁ. (דברים כח:סה)
And among those nations, you will not be calm, nor will your
foot find rest. There, the Lord will give you a trembling heart,
dashed hopes, and a depressed soul.

(8) וְהָיָה בְּשִׁמְעוֹ אֶת דְּבָרֵי הָאֵלָה הַזֹּאת וְהִתְבָּרַךְ בְּלִבּוֹ לֵאמֹר שְׁלוֹם יִהְיֶה לִי
כִּי בִשְׁרָרוֹת לִבִּי אֶלְךָ לְמַעַן סְפוֹת הַרְוָה אֶת הַצְּמָאָה. (דברים כט:יח)
And it will be, when he [such a person] hears the words of this
oath, that he will bless himself in his heart, saying, "I will have
peace, even if I follow my heart's desires," in order to add the
[punishment for the] unintentional sins [of this man] to that of
[his] intentional sins.

(9) וַתִּתְפַּלֵּל חֲנָה וַתֹּאמֶר עֲלֵךְ לִבִּי בִיהוָה רַמָּה קִרְנֵי בִיהוָה רַחֵב פִּי עַל אוֹיְבֵי
כִּי שָׁמַחְתִּי בִישׁוּעֲתֶךָ. (שמואל א ב:א)

And Hannah prayed and said: "My heart has rejoiced through the Lord; My horn has been raised by the Lord. My mouth is opened wide against my enemies, For I have rejoiced in Your salvation.

10 תוֹחֶלֶת מִמְשָׁכָה מַחֲלָה לֵב, וְעֵץ חַיִּים תִּצְאֶה בָּאָה. (משלי יג:ב)
Hope deferred makes the heart sick, but a desire fulfilled is a tree of life.

11 לֵב שִׂמְחָה יִיטֵב פְּנִים, וּבְעֵצָבֶת לֵב רוּחַ נִכְאָה. (משלי טו:ג)
A merry heart makes a cheerful face, but by sadness of heart comes a breaking spirit.

12 אַל יִקְנָא לִבְךָ בַחֲטָאִים, כִּי אִם בִּירְאֵת ה' כָּל הַיּוֹם. (משלי כג:ז)
Let your heart not envy the sinners, but fear of the Lord all day.

c. Samples of references to heart in our Tefilah:

1) ... וְתֵן בְּלִבֵּנוּ לְהִבִּין וְלִהְשָׁכִיל לְשִׁמְעַ לְלַמֵּד וְלִלְמַד לְשָׁמֵר וְלַעֲשׂוֹת וְלִקְיָם אֶת כָּל דְּבָרֵי תִלְמוּד תּוֹרַתְךָ בְּאַהֲבָה. וְהָאֵר עֵינֵינוּ בְּתוֹרַתְךָ וְדַבֵּק לִבֵּנוּ בְּמִצְוֹתֶיךָ וְיִחַד לִבֵּנוּ לְאַהֲבָה וְלִירְאָה אֶת שְׁמֶךָ.... (ברכת אהבה רבה)
... Place in our heart [the ability] to understand, to perceive, to listen, to learn and to teach, to observe, to perform, and to fulfill all the words of the teachings of Your Torah with love. Enlighten our eyes in Your Torah, cause our hearts to cling to Your commandments, and unify our hearts to love and fear Your name....

2) ... הוּא יִפְתַּח לִבֵּנוּ בְּתוֹרָתוֹ וְיִשֵּׁם בְּלִבֵּנוּ אֱהָבָתוֹ וְיִרְאָתוֹ וְלַעֲשׂוֹת רְצוֹנוֹ וְלַעֲבֹדוֹ בְּלִבְבֵּי שְׁלָם.... (ובא לציון)
May He open our heart to His Torah, and instill in our heart love and awe of Him, to do His will and serve Him with a perfect heart.

2. The Kidneys

Thought and emotions – sampling of verses:

וְה' צָבָאוֹת שֹׁפֵט צָדֵק בְּחֹן כְּלִיּוֹת וְלֵב... (ירמיהו יא:כ)
Hashem is a just Judge, Who examines the kidneys and heart....

אֲבָרַךְ אֶת ה' אֲשֶׁר יַעֲצֵנִי אַף לַיְלֹת יִסְרוּנִי כְלִיּוֹתַי. (תהילים טז:ז)
I will bless Hashem Who has given me counsel; in the night my kidneys instruct me.

וְתַעֲלֶזְנָה כְלִיּוֹתַי בְּדַבַּר שְׁפָתֶיךָ מִיִּשְׁרָיִם (משלי כג:טז)
My kidneys will rejoice when your lips speak proper things.

3. Samples of allusions in the Torah to the role of the brain:

a. Question: Why did Yaakov Avinu protect only his head?

Bereishis 28:11

וַיִּפְגַּע בַּמְקוֹם וַיֵּלֶן שָׁם כִּי-בָא הַשֶּׁמֶשׁ וַיִּקַּח מֵאֲבָנֵי הַמְּקוֹם וַיִּשָּׂם מֵרָאשֵׁיתוֹ וַיִּשְׁכַּב בַּמְּקוֹם הַהוּא.

And he arrived at the place and lodged there because the sun had set, and he took some of the stones of the place and placed them around his head, and he lay down in that place.

רש"י: וישם מראשותיו. עשאן כמין מרזב סביב לראשו, שיגרא מפני חיות רעות...

Rashi: "And placed them around his head." He arranged them in the form of a drainpipe around his head because he feared the wild beasts.

Answer:

Likutei Sichos, vol. I (pp. 61-62) (translated from Yiddish)

We need to understand: If he was afraid of the wild beasts, why was he only worried about protecting his head? He should have been concerned about protecting his entire body! It is known that every act of the Forefathers is a sign for what will happen to their descendants. Yaakov's dream, and his exile to Haran, was an omen for his descendants, and the intent was that when the Jewish people will go into exile, they will be fearful from wild beasts – this refers to corrupt ways of thinking and improper perspectives. They will need to protect their minds from heretical ideas and philosophies.... Therefore, Yaakov Avinu took "some of the stones of the place," referring to the holy stones of the [future] place of the Beit ha'Mikdash, to protect the head, for the mind is what is threatened by the dangers of foreign attitudes and ways of thinking....

b. Bereishis 49:26

בְּרַכַּת אָבִיךָ גְּבַרְוּ עַל בְּרַכַּת הוֹרֵי עַד תֵּאָוֵת גְּבַעַת עוֹלָם תְּהֵיִן. לְרֹאשׁ יוֹסֵף וְלִקְדָקֵד נְזִיר אָחִיו.

The blessings of your father surpassed the blessings of my parents, unto the ends of the everlasting hills. May they come to Joseph's head and to the crown (of the head) of the one who was separated from his brothers.

Ha'Amek Davar (the Netziv of Volozhen):

"ולקדקד" - שנוירות ופרישות בא על ידי דביקות בדעת אלקים, וזה במקום המוח שהוא הקדקד, כבמנחות ל"ד בין עיניך זה הקדקד.
"And to the crown" – for consecration and separation come about by clinging to the knowledge of G-d, and this happens in the place of the brain which is the קדקד, as it says in the Gemara Menachos (34a), "... (the Tefillin shall be placed on the forehead) between the eyes" – this is the קדקד.

c. *Tefillin Shel Rosh* – corresponds to the brain

d. The Torah uses the word ראש (head) to refer to a leader who has control over the people under him, because the anatomical head wields control over all of the parts of the body.

4. The Sages knew that thought is in the brain:

Yevamos 9a, Menachos 80b

"כמדומה לי שאין לו מוח בקדקדו..."

"It appears to me that he has no brain in his skull."

Bava Kama 99b

"אמר ליה לעכר מוחך..."

"He said to him, 'Your brain is foggy [if you are asking such a question]!'"

C. Approaches to explaining the Torah's attribution of intellectual capacities to organs other than the brain

1. Some basic answers

a. דבר תורה כלשון בני אדם – "*The Torah speaks in the language of man*"

(*Beis Yishai – Derashos* (Hebrew), Rav Shlomo Fisher zt"l, chapter 47 – "The Brain and the Heart", p. 361; based on Berachos 31a, Kidushin 17b, Bava Metzia 31a, and other places; see also Rambam, Moreh Nevuchim 1:26, and Ibn Ezra to Bereishis 1:26.)

b. לב and כליות do not mean the physical heart and kidneys, but refer to the conceptual "mind" and the "conscience" or "inner workings" of the person

c. The Torah is referring to spiritual elements of thought and emotion, (which may, or may not, correspond to the actual anatomical functions of the physical heart and kidneys).

See תלמוד ומדעי התבל, *Talmud and the Physical Sciences* (Hebrew), Chapter "Anatomy and Physiology" (p. 17), Rabbi Yekutiel Aryeh Kamelhar (1871-1937), referenced below. See also Malbim, Shemos 25:8, quoting and elaborating on the *Tikunei Zohar*.

d. Some explain how the actual heart and kidneys influence thought and behavior

1) The heart provides oxygen to the brain

2) The kidneys support the adrenal glands, which produce hormones which, in the words of Rabbi Avigdor Miller, "increase the energy level, the sugar level, in your blood and they give you other chemicals that give you energy to do things. That's called the counsel of the kidneys. They provide a burst of energy and they give you the push to be active and follow the

counsel of your calm deliberations” (Recorded class, #243, October 1978).

Similarly, adrenaline, produced by the adrenal glands, is both a hormone and a neurotransmitter. It regulates visceral functions (such as respiration), directing or “advising” the brain when and how to respond to fear and stress, and then to restore to calm with the fear and stress is eliminated. The adrenal glands are mainly responsible for homeostasis, serving an “advisory” function by keeping the body at a healthy equilibrium.

e. What we think in our minds influences every part of our being, and thus the word לב is used to refer to the mind, because the heart is considered the interface between man’s thoughts (his spiritual element) and man’s involvement in the world (his physical element) (Rav Eliyahu E. Dessler in *Michtav me’Eliyahu* (Hebrew), vol. IV, Letters, #31(c), p. 356, בענין שכל ולב – “Concerning the matter of the mind and heart”).

f. Some of these approaches are summarized here:

(From a soon-to-be published anthology of responsa of Rabbi Joseph Pearlman (London), edited by Yisrael Shaw:)

The Kidneys Counsel?

Question: The Gemara (Berachos 61a) says that the kidneys advise the person what to do. How does this work? If it’s not literal, what does it mean, and how does the Gemara know it? If it is literal, then was it based on the scientific knowledge of their time?

Rabbi Joseph Pearlman replies:

1. There is no doubt that the ancients attributed functions to the parts of the body which today’s scientific opinion attributes entirely to the brain. Sometimes, this has important Halachic ramifications. For example, today death is usually defined by cessation of brain activity (or, in the vernacular, “brain death”). Halachically, however, one may have to take into account cessation of breathing, etc.

2. In Sefer Yetzirah, one of our earliest compilations attributed to Avraham Avinu, each month of the calendar is assigned a letter of the alphabet, a sign of the zodiac, one of the 12 tribes, one of the senses, and a controlling body part. The month of Nisan is assigned the letter “Heh,” the sheep (Aries) of the Zodiac, and the right hand. It is allocated to Yehudah among the 12 tribes and to the sense of speech. The month of Av is assigned the letter “Tes,” the lion (Leo) of the Zodiac, and the right kidney. It is allocated to Shimon and to the sense of hearing. Elul is assigned the letter “Yud,” the maiden (Virgo) of the Zodiac, and the left kidney. (According to the reading of the Vilna Ga’on, the right kidney is assigned to the month of Iyar and the left kidney to Av.) **There is obviously a deeper spiritual message in all of this.** The different senses are associated with their appropriate months, tribes, letters, zodiacal signs and limbs of the body in order to present an integrated message.

3. In the Midrash (Bereishis Rabah, Parshas Chayei Sarah 61:1), Rabbi Shimon asks: “If Avraham Avinu had no spiritual mentor, from where

did he learn the Torah?” He answers that Hashem provided him with his two kidneys which, like a pair of sages, taught him Torah and wisdom. He bases this on the verse in Tehilim (16:7), “I bless Hashem Who gave me good advice, also at night my kidneys would instruct me.” Similarly, the Midrash relates, “From where did Avraham learn the Torah? Rabbi Shimon said that his two kidneys were like two jugs of water spouting forth Torah” (Bereishis Rabah, Parshas Vayigash 95:3). The Yefeh To’ar asks why specifically the kidneys are mentioned in Tehilim, rather than the heart (Lev) or the mind (Sechel). He answers that although the heart understands, clarification of the truth is attributed to the kidneys. This is presumably what is meant by the dictum in our Gemara, “Lev Mevin u’Kelayos Yo’atzos.” Accordingly, with regard to your question we may suggest that kidneys are related to counsel because they perform a cleansing function in the excretory system. By metaphoric personification, they advise and clarify by separating the unfit from the fit.

4. There is no mention of the brain in the Tanach. It is always referred to as the heart, as in, “You shall love Hashem with all your heart.” Whenever the kidneys are mentioned, it is almost always in conjunction with the heart. Of course, it is possible that the Torah was given in the language of the times. In those days scientific knowledge was far more limited and the function of the brain was not appreciated. Accordingly, in ancient civilizations the brain’s activities were attributed to different parts of the body. However, I prefer to believe that the Torah does so in order to give a spiritual dimension to the physical accumulation of knowledge and brain power. The “Lev,” or heart, is mentioned throughout the Tanach instead of the brain in order to impart an emotional and central dimension to the human mental faculty. This limits the scope of man’s arrogance and sense of self-importance which is implicit in thinking that one’s brain, or “self,” is in complete control. Instead, we are told that each part of the human anatomy contributes to man’s cognitive functioning. This enables us to realize the concept of “Kol Atzmosai Tomarnah Hashem Mi Chamocho” — “All of my bones will say, ‘Hashem, who is like You?’” (Tehilim 35:10).

g. *Sefer Yetzirah*:

פתיחה: “בשלשים ושתים נתיבות פליאות חכמה חקק
 י-ה ה' צבקות אלקי ישראל אלקים חיים ומלך עולם קל
 שקי רחום וחנון רם ונשא שוכן עד וקדוש שמו מרום
 וקדוש הוא וברא את עולמו....”
 “With 32 wondrous paths of wisdom... Hashem
 created His world....”

Sefer Yetzirah, The Book of Creation, in Theory and in Practice. Rabbi Aryeh Kaplan (revised edition, 1997):

The Kabbalists note that the 32 paths of Wisdom have their parallel in the human nervous system. Thirty-one of these paths then parallel the 31 nerves that emanate from the spinal cord. The thirty-second and highest path corresponds to the entire complex of cranial nerves, which are twelve in number.... The nervous system serves a double purpose. First, it transmits messages from the brain to all parts of the body, allowing the mind to control the limbs and organs. Secondly, the

nervous system transmits information from the various senses to the brain. Four of the senses, sight, hearing, taste and smell, come directly through the cranial nerves, which are entirely in the brain. The impulses that come from the lower 31 nerves deal primarily with the sense of touch and feeling. Like the nerves, each of the 32 paths is a two way street. First it is the channel through which the Mind exerts control over creation. Secondly, however, it is also the path through which man can reach the Mind....

In Hebrew, the number 32 is written לב. This spells Lev, the Hebrew word for heart. It is in the heart that the action of the mind is manifest in the body. As soon as the influence of the mind ceases, the heart ceases to function, this being the definition of death.

The heart also provides lifeforce to the brain and nervous system. When the heart stops pumping, the nervous system can no longer function, and the mind no longer exerts influence on the body. The heart therefore serves as a causal link between mind and body.

Suggested readings for Class 6:

תלמוד ומדעי התבל, *Talmud and the Physical Sciences* (Hebrew), chapter "Anatomy and Physiology" (p. 17 et seq.), by Rabbi Yekutiel Aryeh Kamelhar (1871-1937). Available at: <https://hebrewbooks.org/pdfpager.aspx?req=5931&st=&pgnum=30&hilite=>

Malbim, Shemos 25:8 (Hebrew), s.v. וכן בארתי בקונטרס החרש והמסגר . Available at: https://www.sefaria.org.il/Malbim_on_Exodus.25.8.12?lang=he

Meshech Chochmah (Hebrew), Parshas Bo, 12:21. Available at: <https://hebrewbooks.org/pdfpager.aspx?req=54978&st=&pgnum=124>