

CLASS 1

I. Introduction

A. A brief definition of Neuroscience

Neuroscience is the study of how the nervous system develops, including the brain, and its structure and what it does.

Neuroscientists focus on the brain and its impact on behavior and cognitive functions, both on the normal functioning of the nervous system and also what happens to the nervous system when people have neurological, psychiatric, and neuro-developmental disorders.

It's an interdisciplinary science which means that it overlaps closely with other disciplines, such as mathematics, linguistics, electrical engineering, computer science, chemistry, philosophy, psychology, and medicine.

(Adapted from <https://neuro.georgetown.edu/about-neuroscience/>)

B. Two questions

1. What reasons might there be, if any, from a Jewish point of view, to study neuroscience?
2. Does the Torah, or classical Jewish sources, say anything about neuroscience, or the development, structure, or functioning of the brain and nervous system?

C. Let's address the first question: Why study neuroscience from the Jewish perspective?

We will focus on two general reasons for studying the Jewish perspective of neuroscience.

1. First reason: Studying how anything in the physical world works helps us to appreciate its Creator. In fact, it is a mitzvah to study the world, because we inevitably will see the Divine wisdom behind everything.

a. Rambam, Hilchos Yesodei ha'Torah 2:1-2

(א) הא-ל הנקבד והנורא הזה מצוה לאהבו וליראו אותו שנאמר "ואהבת את ה' א-להיך" (דברים ו ה). ונאמר "את ה' א-להיך תירא".

(ב) והיארך היא הדרך לאהבתו ויראתו. בשעה שיתבונן האדם במעשיו וברואיו הנפלאים הגדולים ויראה מהן חכמתו שאין לה ערך ולא קץ מיד הוא אוהב ומשבח ומפארו ומתאוה תאוה גדולה לידע השם הגדול. כמו שאמר דוד "צמאה נפשי לא-להים לא-ל חי" (תהילים מב ג). וכשמחשב בדברים האלו עצמן מיד הוא נרתע לאחוריו ויפחד ויודע שהוא בריה קטנה שפלה אפלה עומדת בדעת קלה מעוטה לפני תמים דעות. כמו שאמר דוד "כי אראה שמיך מעשי אצבעתיך... מה אנוש פי תזכרנו" (תהילים ח ד-ה).

ולפי הדברים האלו אני מבאר כללים גדולים ממעשה רבון העולמים כדי שיהיו פתח למבין לאהב את השם. כמו שאמרו חכמים בענין אהבה שמתוך כך אתה מכיר את מי שאמר והיה העולם.

א) It is a mitzvah to love and fear this glorious and awesome God, as it says, "And you shall love Hashem, your God" (Devarim 6:5), and as it says: "Hashem, your God, you shall fear" (Devarim 6:13).

ב) What is the path [to attain] love and fear of Him? When a person contemplates His wondrous and great deeds and creations and appreciates His infinite wisdom that surpasses all comparison, he will immediately love, praise, and glorify [Him], yearning with tremendous desire to know His great name, as David stated: "My soul thirsts for Hashem, for the living God" (Tehillim 42:3). When he reflects on these matters themselves, he will immediately recoil in awe and fear, appreciating how he is a tiny and lowly creature standing with his limited wisdom before He Who is of perfect knowledge, as David said, "When I see Your heavens, the work of Your fingers... [I wonder] what is man that You should recall Him" (Tehillim 8:4-5).

Based on these concepts, I will explain important principles regarding the deeds of the Master of the worlds so that there will be an opening for a person of understanding to [develop] love for God, as our Sages said regarding love: "In this manner, you will recognize He who spoke and thereby brought the world into being."

b. Rambam, Sefer ha'Mitzvos #3

היא הציווי שנצטוונו על אהבתו יתעלה, והוא: שנתבונן ונסתכל במצוותיו וציווייו ופעולתיו, כדי שנשיגהו ונתענג בהשגתו תכלית התענוג - זוהי האהבה המצווה [עלינו].
The third mitzvah is that we are commanded to love God, and that is: that we will contemplate and closely examine His mitzvos, His commandments, and His works, in order to understand Him, and through this understanding to achieve the ultimate experience of pleasure. This is the goal of the commandment to love God....

1) Let's notice here, in the two quotations from the Rambam, that he mentions two different ways to recognize God in the world, and to come to appreciate and love Him. In the Mishneh Torah, in Hilchos Yesodei ha'Torah, the Rambam mentions only studying the world that God created, while in his Sefer ha'Mitzvos, he mentions studying the Torah and the Mitzvos, in addition to God's "works". These are complementary. Both the study of God's wisdom as revealed to us in the Torah, and the study of His wisdom as revealed to us in the natural world, are essential for recognizing and appreciating God. This is the first reason for studying neuroscience.

2) It's important to mention here that historically, and still now among some scientists, there has been a view that the more that science learns about the world, the less we need to rely on God and religion for "the answers," so to speak. That attitude might apply to other religions in the world, but completely misunderstands the essence of Judaism. As the Rambam writes, the more we discover about the world, the more we appreciate the purposefulness of every detail of existence, and that brings us closer to recognizing the Creator behind it all.

This is what Stephen C. Meyer, Ph.D., writes (see link to article and books at the end of this source page):

In recent years, many scientists have emerged as celebrity spokesmen for atheism. Richard Dawkins, Lawrence Krauss, Bill Nye, Michael Shermer, the late Stephen Hawking, and others have published popular books arguing that science renders belief in God unnecessary or implausible.... Yet, between message and reality, there is a major disconnect. Over the last century, important scientific discoveries have dramatically challenged science-based atheism, and three in particular now tell a decidedly more God-friendly story....

... Molecular biology has revealed the presence in living cells of an exquisite world of informational nanotechnology. These include digital code in DNA and RNA—tiny, intricately constructed molecular machines which vastly exceed our own digital high technology in their storage and transmission capabilities. And even Richard Dawkins has acknowledged that "the machine code of the genes is uncannily computer-like" — implying, it would seem, the activity of a master programmer at work in the origin of life. At the very least, the discoveries of modern biology are not what anyone would have expected from blind materialistic processes.

All this underscores a growing disparity between public perceptions of the message of science and what scientific evidence actually shows. Far from pointing to "blind, pitiless indifference," the great discoveries of the last century point to the exquisite design of life and the universe and, arguably, to an intelligent Creator behind it all.

3) It is also important to be aware of the language we use when we study science, and make sure to avoid phrases like "Nature made" and instead relate it to God.

c. Rabbi Avigdor Miller, "Sing, You Righteous," p. 157

"In all of our studies, let us not lose sight for one moment of the element of striking *Purposefulness*. Every phenomenon, in addition to its usefulness in our lives, is intended by the Creator as a demonstration of His presence."

d. Chovos ha'Levavos, Sha'ar ha'Bechinah 5:18-41

(English translation by Rabbi Moses Hyamson, former chief Rabbi of British Empire, 1925, with revisions of Rabbi Yosef Sebag)

ואחר כן ישיב אל לבו ויסתכל בתועלת אברי גופו ואופני תקנתו בכל אחד מהם הידים לקחת ולתת והרגלים ללכת והעינים לראות והאזנים לשמוע והאף להריח והלשון לדבר והפה לאכול והשנים ללעוס והאצטומכא לבשל והכבד לזקק המזון והסמפונות להוציא המותרות והכיסים (ס"א והמעים) לסבלם והלב משכן החום הטבעי ומנוע החיים והמוח משכן הכחות הרוחניים ומבוע ההרגש ושרש העצבים....
התבונן אחי בחכמת הבורא בהרכבת גופך....

אך רב טוב האלהים עלינו בשכל ובהכרה אשר בהם יחדנו משאר בעלי חיים אין תועלתם לנו נעלמת ממנה בהנהגת גופנו והסדרת תנועותינו מבלעדי מי שפקדם ממנו לפגע שאירע את מוחו....
וכן שאר כל מדות האדם כאשר תבחנם תמצאם בתכלית התקנה והתועלת לו כאשר זכרנו בשכל....

ואומר כי אין אבר שזכרתי תועלותיו שאין סימני החכמה נראים בהרכבתו ותכונתו וחבורו למי שמתבונן בהם ועדותם חזקה וראייתם גלויה על חמלת הבורא עלינו. וכבר באר גל ינוס בכמה ספרים תועלות האברים באר היטב ואילו היינו מכוונים לבאר את זה באבר אחד לבדו היינו יוצאים בדברים מגבול הדרך הקצרה ובמה שהבאנו די להעיר מי שיורהו הבורא דרך הצלתו בעז"ה.

One should then consider and reflect upon the usefulness of the limbs and organs and the ways of his rectification through them - the hands serving for taking and giving; the feet for walking; the eyes for seeing; the ears for hearing; the nose for smelling; the tongue for speaking; the mouth for eating; the teeth for chewing; the stomach for digestion; the liver for purifying the food; the tubes for removing superfluities; the bowels for retention. The heart is the sanctuary of the natural heat and the well-spring of life. The brain is the seat of the spiritual faculties, the well-spring of sensation, and the root from which the nerves begin....

Reflect, my brother, on the wisdom of the Creator manifested in the formation of your body....

The abounding goodness of G-d to us is manifested in the capacities of thought and perception with which he has uniquely endowed us and distinguished us from other living creatures. The value of these faculties in the care of our bodies and ordering of our activities is known to all, with the exception of those who have suffered a loss of these faculties due to brain damage....

So too, all the other faculties of man, if you study them, you will find, display the utmost perfection and are of the utmost benefit to him, as we have shown, regarding the understanding....

I assert that there is not one of these organs the uses of which I have mentioned that does not show to one who reflects on them marks of Divine wisdom in its structure, form and combination with other organs. They display strong evidence and clear proof of the Creator's mercy towards us. Galen, in numerous treatises, has expounded the functions of the bodily organs. Were we to do so in the case of one of these, we would depart from our goal of conciseness. What we have brought, with G-d's help, is sufficient to inspire anyone....

2. Second reason: By understanding the structure of our brain and how it develops and functions, we will be better equipped to carry out our responsibilities as Jews. We can apply our knowledge of how the nervous system works to enhance our Jewish lives practically, both in a physical sense and a spiritual sense.

a. A central idea to Judaism is that every part of our bodies, indeed every part of the world, was created for the sake of the service of Hashem:

Gemara, Yoma 38a

כל מה שברא הקב"ה לכבודו בראו שנאמר כל פעל ה' למענהו
Everything that the Holy One, blessed is He, created, He created for His
glory, as it says, "God made everything for His praise" (Mishlei 16:4).

Chayei Adam #144 ("Tefilah Zakah" customarily recited just before Yom Kippur)

בראת בי מח ולב ובהם חוש המחשבה לחשב מחשבות טובות והרהורים
טובים ולב להבין דברי קדשך ולהתפלל ולברך כל הברכות במחשבה
טהורה...

You created in me a brain and a heart, and in them the faculty of
thought, to conceive good thoughts and proper reflections, and a heart
to understand Your holy words, and to pray and recite all of the blessings
with a pure mind....

- b. **PHYSICAL CARE OF OUR SELVES.** In the physical sense, we are commanded to take
care of our bodies:

Devarim 4:9

"השמר לך ושמור נפשך מאד"

"Beware for yourself and guard yourself well..."

Devarim 4:15

"ונשמרתם מאד לנפשתיכם"

"And you shall guard yourselves well..."

These verses, in their context in the Torah, do not literally refer to watching one's
physical health, but to guarding oneself from certain spiritual dangers (such as
forgetting what we witnessed at Sinai (Devarim 4:9), or making graven images (Devarim
4:15)). Nevertheless, the Gemara (Berachos 32b) records a conversation in which this
verse (Devarim 4:15) is used as a source for guarding one's physical well-being. From
there, we learn:

Levush, Yoreh Deah 116

שיש במשמעות אלו הלשונות שצריך האדם לשמור את נפשו שלא יביא את עצמו
לידי סכנה, אף על גב שפשוטן של אלו הכתובים לא מיירי בזה, מכל מקום סמכו
חז"ל על מקראות הללו ואסרו כל הדברים המביאין את האדם לידי סכנה.

These verses imply that the person must guard his body and not bring
himself to physical danger. Even though the straightforward intention of
these verses is discussing something else, nevertheless our Sages prohibited,
based on these verses, engaging in all things that pose a physical danger to a
person.

Rambam, Hilchos Rotze'ach v'Shmiras ha'Nefesh, 11:4-5

ד) ... וכן כל ממשל נשיש בו סכנת נפשות מצות עשה להסירו ולהשמר ממנו ולהזהר
בדבר יפה יפה, שצאמר "השמר לך ושמור נפשך" (דברים ד ט)....
ה) הרבה דברים אסרו חכמים מפני נשיש בהם סכנת נפשות. וכל העובר עליהן ואומר
הריני מסכן בעצמי ומה לאחרים עלי בקר או איני מקפיד בקר מפין אותו מפת מרדות.

ד) ... Similarly, it is a positive mitzvah to remove any obstacle that could pose
a danger to life, and to be very careful regarding these matters, as it says,

"Beware for yourself; and guard yourself well" (Devarim 4:9). Our Sages forbade many things because they involve a threat to life. Whenever a person transgresses these guidelines, saying: "I will risk my life, what does this matter to others," or "I am not careful about these things," he is deserving of lashes for rebelliousness.

Rambam, Hilchos De'os (4:1)

א) הואיל והיות הגוף בריא ושלם מדרכי השם הוא. שְׁהָרִי אִי אֶפְשֶׁר שְׂיָבִין אוּ יִדַע דְּבַר מִיִּדְעַת הַבּוֹרָא וְהוּא חוֹלֵה. לְפִיכָךְ צְרִיךְ לְהִרְחִיק אָדָם עֲצָמוֹ מִדְּבָרִים הַמְּאֻבְּדִין אֶת הַגּוּף. וְלִהְיֵהיג עֲצָמוֹ בְּדְבָרִים הַמְּבָרִין וְהַמְחַלְיָמִים....

א) Since maintaining a healthy and sound body is among the ways of God, for one cannot understand or have any knowledge of the Creator if he is ill – therefore, he must avoid that which harms the body and accustom himself to that which is healthful and helps the body become stronger....

(Note: The language of the Rambam (as well as the language of the Shulchan Aruch, not quoted here, who cites the Rambam's words) seems to have contradictory indications about whether שמירת הגוף is a Mitzvah d'Rabanan, or a Mitzvah d'Oraisa. Most authorities maintain that it is a Torah Mitzvah.)

By understanding how the nervous system works, we are better equipped to fulfill that mitzvah. (Examples will be given in the next class.)

c. **SPIRITUAL CARE OF OUR SELVES.** In the spiritual sense, when we understand how behavior is learned (or unlearned), we will be better equipped and motivated to improve ourselves, our middot, our relationships, and our Avodat Hashem.

Example: Honoring our parents, respecting the aged:

Shemos 20:12, Devarim 5:16

כְּבֹד אֶת־אָבִיךָ וְאֶת־אִמְךָ....

Honor your father and your mother....

Vayikra 19:32

מִפְּנֵי שִׂיבָה תִּקּוּם וְהִדַּרְתָּ פָּנֶי זָקֵן....

You shall rise before the aged, and you shall respect the elderly.

Gemara, Kiddushin 31a (see also Shulchan Aruch, Yoreh Deah 240:3)

... פעם אחת היה לבוש סירקון של זהב והיה יושב בין גדולי רומי ובאתה אמו וקרעתו ממנו וטפחה לו על ראשו וירקה לו בפניו ולא הכלימה.

... One time he was wearing a silk garment embroidered with gold thread, and he was sitting among the leaders of Rome, and his mother came and tore it off of him, and then she whacked him on his head and spit in his face, and he did not respond disparagingly.

How does having an understanding of neurofunctioning help us to fulfill these mitzvot?

Additional resources for Class 1:

"Too much science gives back to God," Ignacio Sols, Professor of Mathematics, Universidad Complutense, Madrid: <https://en.unav.edu/web/ciencia-razon-y-fe/la-mucha-ciencia-devuelve-a-dios>

"How Science Stopped Backing Atheists and Started Pointing Back to God," Stephen C. Meyer, Ph.D.: <https://www.newsweek.com/how-science-stopped-backing-atheists-started-pointing-back-god-opinion-1724448>. See also his books, *Darwin's Doubt: The Explosive Origin of Animal Life and the Case for Intelligent Design* (HarperOne, 2013), and *Signature in the Cell: DNA and the Evidence for Intelligent Design* (HarperOne, 2009), and *The Return of the God Hypothesis* (HarperOne, 2021).

"Sing, You Righteous," Rabbi Avigdor Miller, pp. 155-183.

Chovos ha'Levavos (Duties of the Heart), Sha'ar ha'Bechina 5:18-41. Available online in English at <https://www.dafyomi.co.il/general/info/chovos/article.php?docid=414#ch5> .