כימיה בישראל
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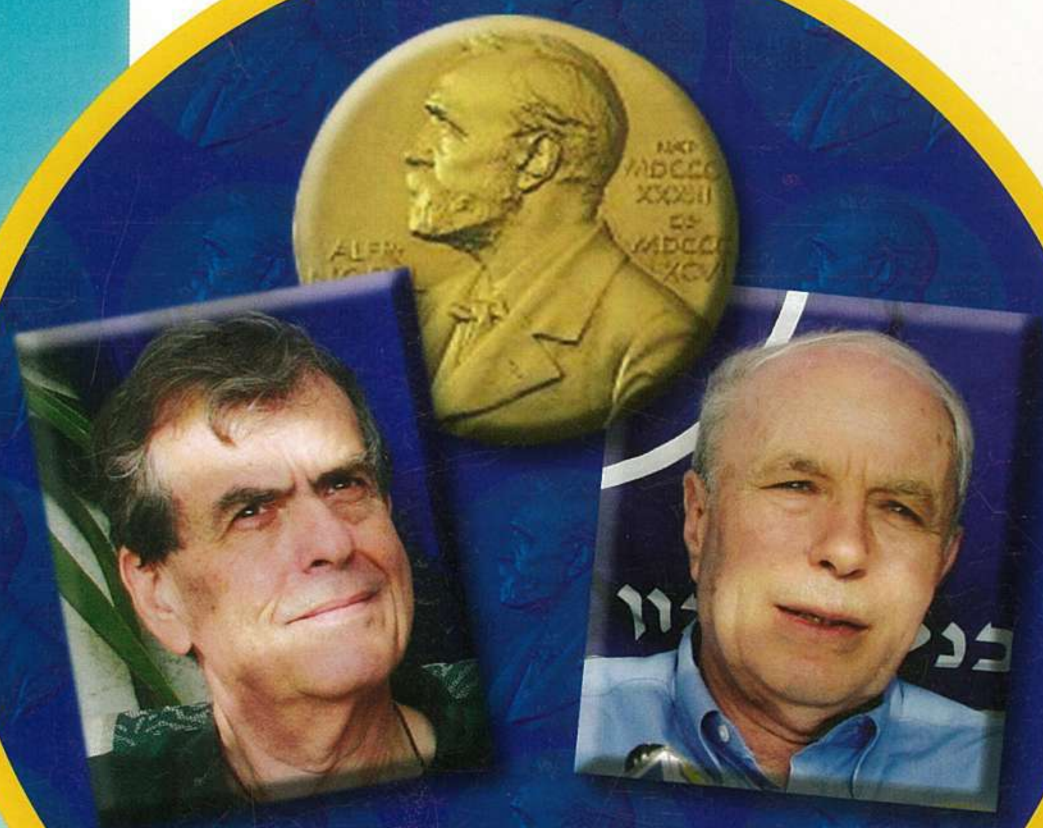

Prof. Aaron Ciechanover and Prof. Avram Hershko
from the Technion
Winners of the
2004 Nobel Prize in Chemistry

כימיה בישראל - בטאון החברה הישראלית לכימיה

גליון מספר 17, טבת התשס"ה, דצמבר 2004 http://www.weizmann.ac.il/ICS

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דבר המערכת

פרס נובל לכימיה לשנת 2004 הוענק השנה לפרופ׳ אהרון צ׳חנובר ופרופ׳ אברם הרשקו מהטכניון. החברה הישראלית לכימיה מברכת את הזוכים על הישגיהם ותרומתם לקידום המדע בארץ ובעולם.

בפברואר 2005 יתקיים הכינוס השנתי ה-70 של החברה, ויצוין בו יובל השבעים.
לציון מאורע זה אנו מביאים בגליון זה את רשימת כל יושבי-הראש והנשיאים של החברה מאז הקמתה בשנת 1933, תוך הבעת הערכה לתרומתם לקידום הכימיה בארץ.

פרופ׳ אדם הלר, בוגר האוניברסיטה העברית, נאלץ לעבור לארצות-הברית בגלל מחלתה הקשה של בתו, כפי שמתואר בהקדמה למאמר. במחקריו שם הצליח להגיע להישגים מרשימים ביותר במעקב אלקטרוכימי, אחר רמת הסוכר בדמם של חולי סוכרת. הישגים אלה, המתוארים במאמר, הגיעו למימוש מעשי והם מסייעים למיליוני חולי סוכרת ברחבי העולם.

״כימיאדה״ - האולימפידה הארצית לכימיה, לשנת 2003/4 תשס״ד, התקיימה בטכניון. התחרות משכה מספר רב של תלמידי תיכון מכל הארץ והיא נותנת בכך תנופה ללמודי הכימיה בארץ. דווח על שלב הגמר של הכימיאדה ועל הזוכים בתחרות מובא על ידי מירה כץ.

במדור מן הארכיון מביא ד״ר בוב וינטראוב את סיפורו של פאול ארליך, אבי הכימותרפיה, ואת תמיכתו בהקמת האוניברסיטה העברית בירושלים.

לפני זמן קצר הלך לעולמו פרופ׳ מרדכי פולמן, מבכירי הכימאים בטכניון. דברים לזכרו מובאים בגליון זה.

תקון טעות

בגליון 16 , עמוד 35 , נשמטה בטעות ההרצאה הבאה:

Amnon Stanger, Technion The Myth of NICS

The Royal Swedish Academy of Sciences
has decided to award the

Nobel Prize in Chemistry for 2004

"for the Discovery of Ubiquitin-mediated Protein Degradation"

jointly to

Aaron Ciechanover
Technion, Israel Institute of Technology, Haifa, Israel

Avram Hershko
Technion, Israel Institute of Technology, Haifa, Israel

Irwin Rose
University of California, Irvine, CA, USA

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The Israel Chemical Society

החברה הישראלית לכימיה

יושבי הראש והנשיאים של החברה הישראלית לכימיה מאז הקמתה לפני 70 שנה

בשנת 1933 החליטה קבוצה של כימאים בארץ ישראל המנדטורית, שיש צורך בהתארגנות על בסיס מקצועי, בעיקר על מנת למצוא פתרונות תעסוקה לכימאים הרבים שעלו מארצות אירופה. לשם כך הם קיימו ועידה ארצית, באוניברסיטה העברית על הר הצופים בירושלים. בועידה הוחלט על הקמת "הסתדרות הכימאים בארץ-ישראל", ונקבעו מטרותיה. ליושב הראש הראשון נבחר פרופ' מרדכי בובטלסקי, מהאוניברסיטה העברית.

כמה שנים לאחר הקמת המדינה שונה השם ל- "החברה הישראלית לכימיה" ונקבע תקנון חדש . ניתן לעיין בתקנון באתר החברה הישראלית לכימיה: http://www.weizmann.ac.il/ICS/new_pages/about_hb.html

לנשיאה הראשון של החברה, במתכונתה הנוכחית, נבחר פרופ' שלום שראל, מהאוניברסיטה העברית.

לציון שנת ה-70 להקמת "הסתדרות הכימאים בארץ-ישראל" אנו מביאים בזה את רשימת יושבי הראש והנשיאים לדורותיהם, ומביעים בזה את הערכתנו לתרומתם.

הסתדרות הכימאים בארץ-ישראל 1960 - 1933

פרופ' מרדכי בובטלסקי 1946 - 1933

נולד בשנת 1890 בליטא. עלה ארצה בשנת 1925. נפטר בשנת 1965.

את לימודי הדוקטורט סיים בשנת 1923 באוניברסיטת ברן בשוויץ. עם עלייתו ארצה, הצטרף למחלקה לכימיה, באוניברסיטה העברית על הר הצופים בירושלים. לאחר מכן היה לפרופסור וראש המחלקה לכימיה אי-אורגנית ואנליטית.

שטחי המחקר שלו כללו קומפלקסים אי-אורגנים, הטרומטריה, ושיטות אנליטיות.

פרופ' הונו היימן 1948 - 1946

נולד בשנת 1896 בגרמניה. עלה ארצה בשנת 1933. נפטר בשנת 1978.

את לימודיו האקדמיים, בשטח הטכנולוגיה הכימית, עשה באוניברסיטת בון. עבד תקופה קצרה בחברת א.ג. פרבן. שנתיים לאחר עלייתו ארצה הקים את המחלקה לכימיה תעשייתית בטכניון, כיום הפקולטה להנדסה כימית.

פרופ' הימן כיהן כדיקן המחלקה לכימיה תעשייתית בשנות הארבעים והחמישים.

ד"ר יהודה הירשברג 1955 - 1948

נולד בשנת 1902 בפולין. נפטר בשנת 1960.

עלה ארצה בשנת 1923 והצטרף לקיבוץ. החל בלימודים אקדמיים בפקולטה למדעים באוניברסיטה העברית לפני שהוסמכה למתן תואר אקדמי בכימיה. לאחר מכן סיים את למודי הדוקטורט באוניברסיטת ברוקסל בבלגיה, בשנת 1931. לאחר עבודה כעוזר מחקר במשך שנתיים, חזר ארצה בשנת 1933 והיה לכימאי הפיסיקלי הראשון והיחיד במכון למחקר על שם דניאל זיו.

שטח עבודתו היה פוטוכימיה. בשנת 1950 הוא גילה את תופעת הפוטוכרומיזם ואת הזיכרון הפוטוכימי, וזכה לתהודה רבה בעולם המדעי. בשנת 1953 קבל את פרס ויצמן.

פרופ׳ דוד גינצבורג 1955-1957

נולד בשנת 1920 בארצות הברית. עלה ארצה בשנת 1948. נפטר בשנת 1988.
לאחר עלייתו ארצה, הצטרף למכון ויצמן, שם ביצע סינתזה טוטלית של מורפין.
בשנת 1954 עבר לטכניון וייסד את הפקולטה לכימיה וכיהן כדיקן הפקולטה במשך מספר שנים. כמו כן כיהן כנשיא הטכניון בפועל בשנת 1961. בנוסף מילא תפקידים רבים בטכניון ובמימסד המדעי בארץ.
המציא את תחום מחקר הפרופלאנים בכימיה אורגנית ופרסם כמאה מאמרים בנושא.
פרופ׳ גינצבורג היה חבר באקדמיה הלאומית למדעים, קבל את פרס ויצמן ב- 1954, פרס רוטשילד לכימיה ב- 1965, פרס ישראל למדעים מדויקים ב- 1972 ופרס הופמן, מטעם האגודה הגרמנית לכימיה, ב- 1983.

ד״ר הרברט ברנשטיין 1957-1959

נולד בשנת 1914 בארצות-הברית. עלה ארצה בשנת 1947. נפטר בשנת 2001.
את לימודי הדוקטורט עשה ב- Pennsylvania State University ופוסט-דוקטורט בפרינסטון.
עם עלייתו הצטרף למכון וייצמן ושירת בחיל המדע במלחמת העצמאות.
היה ממניחי היסוד לתעשיה הכימית בארץ. הקים את חברת ״קדימה״ לדטרגנטים וכימיקלים, בחיפה ב-1950 ועמד בראש מחלקת המחקר והפיתוח בחברת דשנים וחומרים כימיים.
לאחר מכן ניהל את מוסד הטכניון למחקר ופיתוח במשך מספר שנים.

פרופ׳ פליקס ברגמן 1959-1960

נולד בשנת 1908 בגרמניה. עלה ארצה בשנת 1933. נפטר בשנת 2002.
היה בין הכימאים הראשונים במכון זיו ברחובות. הקים את המחלקה לפרמקולוגיה, בפקולטה לרפואה באוניברסיטה העברית בירושלים.
שטחי המחקר שלו היו כימיה סינתטית ופרמקולוגיה.

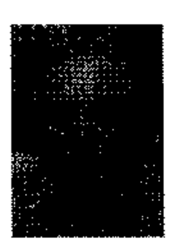
החברה הישראלית לכימיה

פרופ׳ שלום שראל 1960-1964

נולד בשנת 1918 בירושלים.
את עבודת הדוקטור בצע במכון זיו והתואר ניתן דרך האוניברסיטה העברית בשנת 1945. היה פרופסור לכימיה אורגנית באוניברסיטה העברית ולאחר מכן הקים את המחלקה לכימיה רפואית בבית הספר לרפואה באוניברסיטה העברית.
שטח המחקר העיקרי שלו הוא בכימיה פרמצבטית.

פרופ׳ דוד גינצבורג 1964-1969

ראה לעיל.



פרופ׳ מיכאל קאים 1969-1972

נולד בשנת 1924 ברומניה. עלה ארצה בשנת 1941.
קבל B.Sc מאוניברסיטת לידס באנגליה בשנת 1951, ו- D.Sc. מהטכניון בשנת 1955. הצטרף לסגל הפקולטה לכימיה בטכניון ב- 1958 ושמש כדיקן הפקולטה בשנים 1972-1976.
שטחי המחקר העיקריים שלו הם קטליזה הומוגנית בעזרת קומפלקסים אורגנו-מתכתיים במערכות כימיות וביולוגיות, דיאגנוסטיקה רפואית וטכנולוגיה של הפרדה.

פרופ' סעדיה עמיאל 1972-1974

נולד בשנת 1930 בארץ. נפטר בשנת 1978.

את הדוקטורט קבל מהאוניברסיטה העברית בשנת 1955, לאחר שבצע את המחקר במכון ויצמן. היה ראש המחלקה לכימיה גרעינית, במרכז למחקר גרעיני שורק ביבנה, ופרופסור לכימיה גרעינית, באוניברסיטה העברית.

שטחי מחקריו כללו איזוטופים רדיואקטיביים וכימיה של קרינות.

פרופ' דוד לביא 1977-1974

נולד בשנת 1916 במצרים. נפטר בשנת 2003.

את עבודת הדוקטור בצע במכון זיו והתואר ניתן דרך האוניברסיטה העברית בשנת 1945. היה פרופסור במחלקה לכימיה אורגנית במכון ויצמן.

שטחי המחקר העיקריים שלו היו בתחום חומרי טבע כתרופות למחלות שונות כולל מחלות ויראליות וסרטן.

פרופ' מיכאל אלבק 1977-1980

נולד בשנת 1934 בברלין.

קבל דוקטורט בשנת 1962 באוניברסיטה העברית. לאחר כמה שנות עבודה במכון לסיבים ומוצרי יער ובחברת "מקורות", הצטרף לסגל המחלקה לכימיה באוניברסיטת בר-אילן. היה דיקן הפקולטה למדעי הטבע בשנים 1967-69 ו-1973-75, רקטור האוניברסיטה בשנים 1982-86 ונשיא האוניברסיטה בשנים 1986-89.

שטחי המחקר שלו כוללים שימוש בתרכובות אורגנו-טלוריום בסינתזה אורגנית וכתרכובות המעוררות את המערכת החיסונית.

ד"ר רלף הגר 1980-1984

נולד בשנת 1927 ברומניה. עלה ארצה בשנת 1940.

את הדוקטורט קבל מאוניברסיטת ציריך בשווייץ ב-1956.

היה מרצה במחלקה לכימיה אורגנית בטכניון. ב-1962 עבר למפעל "אביק", שלימים נרכש על ידי חברת "טבע", כמנהל המחקר והפיתוח.

פיתח תרופה חדשה שנקראה "אבימסטן 100" שנועדה לריפוי מחלת דלקת העטין בעדרי הבקר, וכן עסק במחקר ופיתוח של תרופות אחרות.

פרופ' חיים לבנון 1984-1987

נולד בשנת 1938 בירושלים.

קבל דוקטורט מהאוניברסיטה העברית ב-1969. השתלם כפוסט-דוקטורנט באוניברסיטת וושינגטון בסנט-לואיס, ארה"ב, ב-1972. מאז שובו הוא במכון לכימיה באוניברסיטה העברית. שימש כראש המחלקה לכימיה פיסיקלית וכמנהל מרכז פרקש לתהליכים מושרי אור.

שטחי המחקר שלו כוללים ספקטרוסקופית EPR, פוטוסינתיזה, תהליכים פוטוכימיים ופוטופיזיים בגבישים נוזליים, והיבטים יישומיים של פולריזצית הספין האלקטרוני לקראת פעולת מייזר בטמפרטורת החדר.

פרופ' דן מאירשטיין 1987-1991

נולד בשנת 1938 בירושלים.

קבל דוקטורט מהאוניברסיטה העברית בשנת 1965.

היה ראש המחלקה לכימיה בקריה למחקר גרעיני בדימונה. כיום הוא משמש כפרופסור במחלקה לכימיה באוניברסיטת בן-גוריון בנגב, ונשיא המכללה האקדמית יהודה ושומרון באריאל.

שטחי המחקר שלו כוללים כימית קרינה, כימיה ביו-איאורגנית, קומפלקסי מתכות במצבי חמצון לא-רגילים, ריאקציות חיזור, וקינטיקה של רדיקלים חופשיים.

פרופ' אלפרד הסנר 1991-1994

נולד בשנת 1930 ברומניה. שרד את השואה.

למד בוינה ואחר כך בארצות הברית, שם קבל דוקטורט מאוניברסיטת נברסקה, בשנת 1956. לאחר מכן היה פוסט-דוקטורנט באוניברסיטת הרווארד. שימש כפרופסור לכימיה באוניברסיטת קולורדו, ולאחר מכן באוניברסיטת מדינת ניו-יורק בבינגמטון.

עלה ארצה בשנת 1983. לאחר שנה במכון ויצמן, עבר לאוניברסיטת בר-אילן כפרופסור לכימיה.

שטחי מחקריו כוללים שיטות חדשות בסינטזה אורגנית, סינטזה סטראו-סלקטיבית בתרכובות חנקן אורגניות, תרכובות הטרוציקליות, ומולקולות אורגניות פעילות במערכות ביולוגיות.

פרופ' שמעון שצמילר 1994-1997

נולד בשנת 1942 בחיפה.

קבל תואר D.Sc. מהטכניון בשנת 1982. כיום הוא משמש כפרופסור וראש המחלקה לכימיה ביולוגית במכללה האקדמית יהודה ושומרון באריאל.

שטחי המחקר שלו כוללים עיצוב וסינתזה של חומרי הדמאה ומערכות הדמאה לרדיוגרפיה; חומצות אמיניות לא טבעיות ושילובן בפפטידים; פיתוח תהליכים תעשייתיים לייצור תרופות חדשות וחומרי ביניים שלהם; שימושים של מלחי ליתיום אורגניים.

פרופ' ארנון שני 1997-2003

נולד בשנת 1935 בנס-ציונה.

תואר דוקטור קבל במכון ויצמן בשנת 1965. לאחר בתר-דוקטורט באוניברסיטת שיקגו ומשרה של עמית מחקר באוניברסיטה העברית, היה בין ראשוני אוניברסיטת בן-גוריון בנגב וממקימי המחלקה לכימיה בה, החל משנת 1968. שימש ראש מחלקה, משנה לרקטור האוניברסיטה ומנהל המכונים למחקר שמושי. תחומי המחקר שלו כוללים הכנת נגזרות חדשות של שעוות החוחובה ומציאת יישומים טכנולוגיים לנגזרות השונות; כימיה ואנטומולוגיה של פרומונים ויישומם בחקלאות. במסגרת פעילות זו יזם והקים, יחד עם פרופ' שלמה מגדסי מהאוניברסיטה העברית, את חברת "PheroCap", לייצור תכשירים ידידותיים לסביבה, להדברת מזיקים בחקלאות, בשיטת ה"בלבול" (הפרעה בתקשורת הכימית) באמצעות פרומונים.

פרופ' שמאי שפייזר 2003-

נולד בשנת 1941 בחיפה.

קבל את כל תאריו האקדמיים מהטכניון. לאחר תקופת השתלמות בתר-דוקטורט בהולנד, הצטרף ב-1973 לסגל הפקולטה לכימיה בטכניון, בה הוא משמש כיום כפרופסור וכמחזיק הקתדרה ע"ש יוסף פרוינד.

בשנים 1987-1990 שימש כראש לשכת הקשר לנוער (כיום היחידה לפעולות נוער) בטכניון, ובשנים 1991-1994 כיהן כדיקן הפקולטה לכימיה, וכיום מכהן כדיקן היחידה ללימודי המשך.

בשנת 1993 זכה בפרס ניו-אינגלנד, ב-1997 בפרס מחקר של ה-JSPS, ב-2001 בפרס טאוב, וב-2002 זכה במדלית אוניברסיטת ליון.

תחומי המחקר שלו, עוסקים בין השאר בשימושי לייזרים בכימיה, פוטופיסיקה של מולקולות אורגניות ובאופטו-אלקטרוניקה ואלקטרוניקה מולקולרית.

ELECTROCHEMISTRY IN THE SERVICE OF DIABETES

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A personal foreword on medical diagnostics

My professional life began when I entered the Hebrew University in Jerusalem in 1952, as a chemistry student. I was blessed with having Prof. Ernest David Bergmann as my PhD thesis advisor, mentor and life-long example.

I met Ilana in Prof. Lichtenstein's biochemistry class in 1954, and we were married in 1956. Our daughter Tali was born in Jerusalem in the cold winter of 1958. She was sick from the day she was born till the day she died, at the age of 24. Her lifelong suffering resulted from severe misdiagnosis of her problem just after she was born. The pediatric staff of Hadassah Medical School of the Hebrew University in Jerusalem diagnosed her as being allergic to cow's milk, when in fact she was born without valves between her urethra, bladder and kidneys. The repair of her valves would have been a minor operation. Tali's misdiagnosis led to urinary reflux and to chronic kidney infection, which resulted in recurrent episodes of high fever, convulsions and, eventually, brain damage. During one of these episodes, when Tali was 8 months old, she was treated with deafness-causing dihydrostreptomycin. The pediatric staff of Hadassah again misdiagnosed her as retarded, though she was profoundly deaf.

When Tali was about 3 years old, and did not walk, we took her to Israel's legendary orthopedic surgeon Dr. Spiro at the Tel Hashomer hospital. It was he who first observed that the reason she could not walk was that her inner ear, controlling her sense of balance, was damaged. It was through him that we found out that she was deaf and that other functions of her brain were damaged. Tali's urinary reflux were diagnosed too late, only when she was 7 years old, while she was enrolled in a special program for brain damaged children at the Lexington School for the Deaf in New York. By then, one of her kidneys did not function at all, and the other was severely damaged. The surgical repair of her missing valves was performed 7 years too late. Until Tali's death of kidney failure, in 1982, I worked wherever the special schools she needed were located.

In 1987 I had the opportunity to work on medical diagnostics, and devoted since then most of my time to this field. I was not the only one in our family to do so. During most of her professional life, Ilana also developed diagnostic tests; so did our two sons, Ephraim and Jonathan. Jonathan is a Vice President of Predicant, a venture developing early diagnostic tests for cancer. Ephraim, who co-founded with me the TheraSense Company and was its first President, is now the CEO of Angioscore, a company developing and manufacturing angioplastic balloons for coronary stenting. TheraSense was acquired by Abbot Laboratories in 2004 for $1.2 billion. I assigned to the University of Texas my entire share in the royalty income from my 46 issued US Patents and their international equivalents, representing and protecting most of the science and the technology on which TheraSense was built.

Electron Conducting Protein

After graduating from the Hebrew University in 1961, I worked on a number of subjects including scintillators, liquid lasers, lithium batteries, photo-electrochemical and hydrogen-evolving solar cells and electronic materials. Of these, the scintillators and the lithium-thionyl chloride batteries went into production. The batteries were first produced in Israel, by Tadiran, near Rehovot. They are presently manufactured and used worldwide.

In 1986, I headed the Electronic Materials Research Department of Bell Labs. My department laid the foundations of today's high density silicon integrated circuit interconnection technology. It was the unwritten rule of Bell Labs that after hours and on weekends the managers, at all levels, worked as scientists or engineers, with their own hands, in their laboratories. As I keenly avoided competing with the colleagues who reported to me, I worked on semiconductor-liquid junction solar cells and on photo-electrochemical hydrogen producing cells. This was done with Yinon Degani, who joined me after obtaining his Ph.D. from the Hebrew University.

My 18 year long excursion into diagnostics started when I read an article by W. J. Albery and colleagues (1). They reported that the flavin adenine dinucleotide ($FADH_2$) redox centers of the enzyme glucose oxidase (GOx) transfer electrons across a thick, electrically insulating, protein shell to ionic organic metals, such as the tetrathiafulvalene 7,7,8,8-tetracyano-quinodimethane salt, TTF-TCNQ, even though they do not transfer electrons across this shell to any of the conventional metals. Being in the world of electronic materials, I was fascinated by the implications of the study. If indeed it were true that the distance across which electrons tunnel through an insulating matrix depends on the ionicity of the contacting metal, simpler and easier to manufacture superconducting Josephson junction devices could have been designed. However, Frank DiSalvo and I quickly showed that ionic metal contacts do not affect the electron tunneling distance.

Remaining puzzled by Albery's report, Degani and I repeated the experiment and discovered that the TCNQ of the salt reacted, as quinones usually do, with thiol and amine functions of the GOx protein. As a result, the protein acquired multiple electron or hole (electron vacancy) transferring redox centers and turned from a good electronic insulator into a poor electronic conductor. Electrons propagated in the protein stepwise, across short distances, by tunneling from reduced to oxidized quinone redox centers, while holes propagated by tunneling from oxidized to reduced centers.

With this understanding in hand, we set out to purposely decorate the insulating protein of GOx with fast ferrocene/ ferricinium redox centers. The ferrocene/ferrocinium redox couple (2) was known to self-exchange electrons rapidly. It was used as a diffusing mediator to shuttle electrons between redox proteins and electrode (3), and it was also used to diffusionally shuttle electrons between GOx and electrodes in glucose sensors for diabetes management. We bound these fast centers to the GOx protein to create electron tunneling paths connecting the GOx $FADH_2$ reaction centers to carbon or gold electrodes (4, 5). In our first critical experiments, we exposed the partially urea-denatured inner protein domains of GOx to a carbodiimide activated ferrocene/ferricinium carboxylate ester, reacting lysine-amines and forming ferrocene carboxamides. The decoration of the partly unfolded protein with the fast ferrocene/ferricinium redox couple turned the electronically insulating protein into an electron or hole conductor. After re-naturing, the buried GOx $FADH_2$ redox centers transferred their electrons to electrodes via the now protein bound fast redox centers. Because the FAD of the conducting GOx was reduced by glucose to $FADH_2$ (Equation 1), glucose was directly electro-oxidized and the electro-oxidation was observed as a current (Equation 2). Our experiment was eminently successful (6, 7).

$$\text{GOx-FAD} + \text{glucose} \rightarrow \text{GOx-FADH}_2 + \text{gluconolactone} \quad (1)$$

$$\text{GOx-FADH}_2 \rightarrow \text{GOx-FAD} + 2\ H^+ + 2\ e^- \quad (2)$$

The experiment opened the way to the direct transduction of fluxes of biochemicals to electrical currents, adding an interface between electronics, medicine and biology. Bell Labs, which I loved and which in 1987 was considered as the best place in the world for work on electronic materials and devices, was not the best place to develop the new medical-biological interface. I decided, therefore, to accept the offer of my colleagues at the University of Texas, to appoint me to the Ernest Cockrell Sr. Chair in Engineering and moved to Texas in the fall of 1988.

Electrical "Wiring" of Enzymes: Electron Conducting Hydrogels

Through the first year after my move to Austin, I continued to work part time at Bell Labs. In this year Degani and I showed that the $FADH_2$ redox centers of GOx can be electrically "wired" to an electrode not only by decorating the protein with fast redox centers, but also by precipitating on electrodes thin water insoluble films of the electrostatic adduct of GOx, which is a polyanion at neutral pH, and polycationic co-polymers of vinyl ferrocene (8, 9). Brian Gregg, who joined my Austin research group, synthesized GOx "wiring" electron conducting hydrogels. The electron-conducting hydrogels were crosslinked, water soluble polymers containing fast, osmium poly-pyridine-based redox centers. The immobilized, non-leachable redox centers in the 3-dimensional matrix were reversibly electroreduced and electrooxidized, extending electrochemistry from the two-dimensional surfaces of electrodes to the 3-dimensional volumes of the electron conducting hydrogels (10). Next, we formed electroactive enzyme containing hydrogels by crosslinking non-precipitating electrostatic adducts of polyanionic GOx and an excess of the polycationic osmium complex redox center containing, polyvinyl pyridine based, redox polymer. The 3-dimensional hydrogel had two unique properties: its GOx molecules were electrically "wired" to the electrode, and the gel was highly permeable to electrolytes, to glucose and to gluconolactone. We had, for the first time, a 3-dimensional electrocatalytic film for the electrooxidation of glucose (11, 12). In its volume, electrons and holes were transported through collisions between Os^{2+} and Os^{3+} redox centers which were tethered to the polyvinyl pyridine backbone, but their polymer segments moved within the polymer (13). (Figure 1) A recent optimized version of such a polymer (14), designed by Fei Mao, is shown in Figure 2.

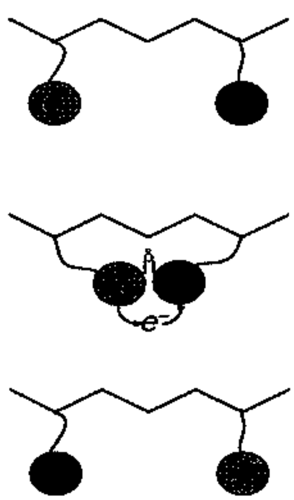

Figure 1. Electron conduction in redox hydrogels results of electron transfer between reduced and oxidized redox centers tethered to the backbone of polymers.

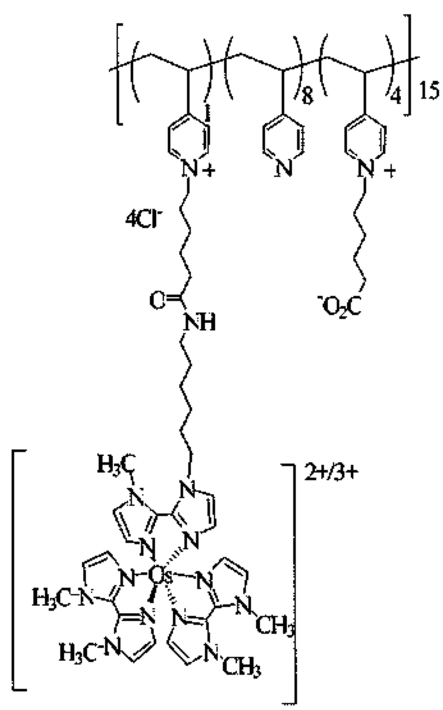

Figure 2. A "wire" of glucose oxidase, allowing the electrooxidation of glucose at – 0.1 V vs. Ag/AgCl at a current density of 1.3 mA cm^{-2}. The 5.8×10^{-6} cm^2 s^{-1} apparent electron diffusion coefficient in the hydrogel formed of the crosslinked polymer approached the diffusion coefficient of ions, like Cl^-, in water (14).

Through the rapidly electron-exchanging redox centers bound to its crosslinked polymer backbone, the water of the hydrogel, normally an ionic conductor but an electronic insulator, is made into an electron conductor.The electrons diffuse by exchange between colliding redox centers, tethered to backbones of the polymers. When the tethers are long and flexible, the amplitudes of the redox centers are large, and the electrons diffuse as rapidly as their charge-balancing ions diffuse in water. The apparent electron diffusion coefficients reach 6×10^{-6} cm^2 s^{-1}. The hydrogels are permeable to water-soluble molecules and ions. Electrons are transferred between reaction centers of enzymes and redox centers of their enveloping gels.

The "wiring" of GOx in the 3-dimensional hydrogels provided glucose electrooxidation current densities as high as 10^{-3} A cm^{-2}. Because electrooxidation and electroreduction currents, as small as 10^{-10} A can be easily monitored with simple and inexpensive potentiostats, we were able to build the first directly glucose electro-oxidizing microelectrodes. These were built by Michael V. Pishko, at the time a Ph.D. candidate in Chemical Engineering, by coating the 7 µm diameter tips of carbon fibers with the "wired" GOx hydrogel (15).

Subcutaneously implantable "wired" glucose oxidase electrodes

The unprecedented miniaturization of the directly glucose electrooxidizing electrodes encouraged us to build small electrodes, that when implanted under the skin, could monitor the glucose concentration in the subcutaneous interstitial fluid. To build their research prototypes, we had to simultaneously solve four difficult problems: First, we had to down-shift the potential at which glucose was electrooxidized, in order to reduce the interference by electrooxidizable constituents of the subcutaneous interstitial fluid, like urate and acetaminophen (16); second, we had to form reproducibly, on the small surfaces, glucose transport limiting films, in order to provide the required 2-30 mM measurement range encountered in diabetes (17, 18); third, we had to overcoat the implanted parts with a bioinert film, to reduce biofouling, thrombogenesis (in case the implant is accidentally in a small blood vessel), and immune reaction (leading to accumulation of glucose-consuming and oxidant generating neutrophils) (19); and fourth, we had to chemically and mechanically stabilize the electrocatalytic films for their intended 3 day continuous operation in-vivo (20). The first miniature (0.5 mm^2) subcutaneously implanted continuous glucose monitor, based on "wiring" of glucose oxidase, was built and tested at UT, in rats, in 1993 (17).

Figure 3 shows the electrodes we implanted in rats, and that Ephraim and I wore, in 1995. The counter-reference were on-the-skin, commercially available EKG Ag/AgCl electrodes. The electrodes, of 0.25 mm diameter, were made of polyimide insulated gold wires, the tip of which was etched out to form a 0.09 mm deep cavity in which successive layers of the "wired" enzyme, a glucose transport reducing polyethylene glycol diglycidyl ether

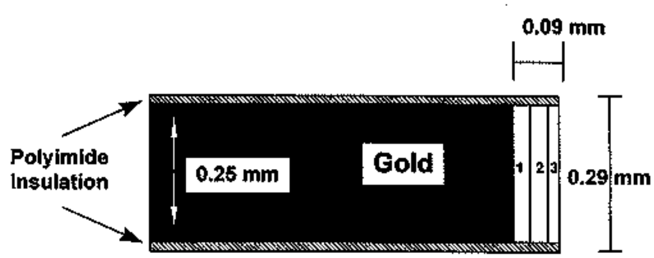

Figure 3. Structure of the 2000 version of the continuously glucose monitoring subcutaneously implanted "wired" GOx electrodes. 1: "Wired" enzyme sensing layer. 2: Layer by layer assembled polycation-polyanion glucose transport controlling membrane. 3: Biocompatible polyethylene oxide film (24).

crosslinked film of poly(N-vinylimidazole), and a bioinert photocrosslinked film of polyethylene glycol diacrylate were deposited (18). Between 1995 and 2000 the electrode was extensively tested in humans (Ephraim and I), in a Type 1 diabetic chimpanzee (Figure 4) (21) and in rats infused with glucose and with insulin (22, 23, 24)

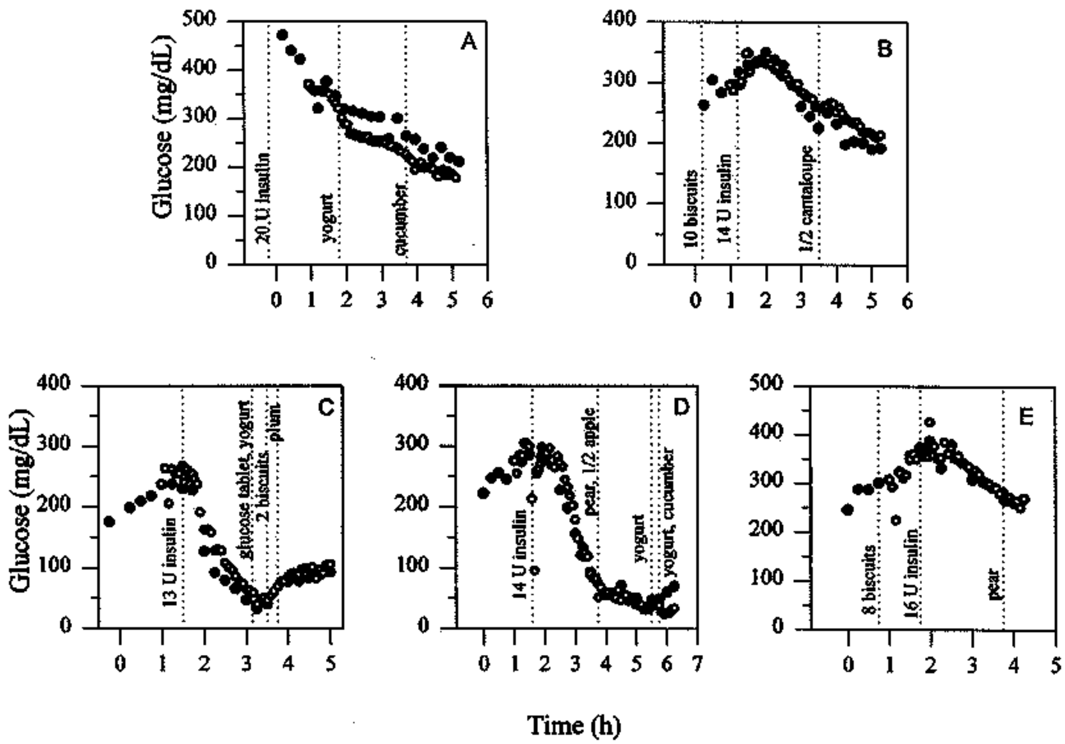

Figure 4. Comparison of results of blood glucose assays [•] and the readings of the subcutaneously implanted monitor implanted in a type 1 brittle diabetic chimpanzee [O] (21).

The founding of TheraSense

My son, Ephraim (BA Cum laude Harvard, Physics, 1984, MBA Yale, 1989) joined HP after his graduation, and in 1992, he left HP to create two companies, one based on our results on the "wiring" of enzymes, and the other based on our results on the photocatalytic oxidation of organic contaminants of water and air. After improving and selling the photocatalyst's core technology of binding the photocatalytic TiO_2 particles to surfaces, he concentrated exclusively on products for diabetic people. The company he founded was located until 1994, in the technology incubator associated with the University of Texas in Austin, then in Alameda, CA, where it was re-named TheraSense. Between 1994 and 2004, I spent about two weeks every month in Austin and about two weeks in Alameda.

Diabetes affects 300 million people, which are 5% of the world's population. Its complications are a major cause of blindness, kidney failure, amputations of limbs, nerve degeneration and vascular disease. Its annual cost to the world economy is more then 100 billion dollars. Diabetes complications can be prevented by tightly controlling the concentration of blood glucose. Tight control requires frequent (daily ~ 5) blood glucose assays. Six billion glucose assays are performed each year, more than all other analytical assays combined. Ephraim and I founded TheraSense to maintain the health of diabetic people with less pain and worry. Through TheraSense, we succeeded in removing the pain of monitoring by reducing the volume of blood required for the glucose assay and in reducing the worry of diabetic people, by developing a continuous glucose monitor, which broadcasts the actual glucose concentration and predicts impending high or low glucose levels. We have taken a key step in establishing the foundation for an artificial pancreas, based on the continuously broadcasting glucose monitor and an insulin pump.

One of the first people we hired at TheraSense was an electrochemist, Ben Feldman. Next, we added a manufacturing engineer, Phil Plante. Both made key contributions to the success of the company. The initial focus of TheraSense was the enzyme "wiring" based subcutaneously implanted glucose sensor for diabetes management. In 1996, Ephraim conceived, and Ben and I designed, a second product, a micro-coulometric blood glucose monitor for diabetes management. It required an order of magnitude less blood than other systems on the market, only 300 nL, a sample so small that it is painlessly obtained. The device takes advantage of the fact that the smaller the blood volume, i.e. the thinner the micro-coulometer's liquid layer is, the faster its glucose is electrooxidized. We designed therefore a thin-layer (50 μm) micro-coulometer, in which glucose is selectively electro-oxidized in 5-12 seconds. It is the first mass-produced sub-microliter fluidic device, of which billions are produced. It is also the most accurate blood glucose monitor available to self monitoring diabetic people. It is more accurate than the earlier amperometric blood glucose monitors, because the outcome of coulometry is not affected by temperature, blood viscosity, glucose electrooxidation catalyzing enzyme activity or by preferential electro-oxidation of interferants. The initial non-commercial version of the micro-coulometer had a "wired" PQQ-glucose dehydrogenase anode. Because the anode had no leachable redox mediator, the noise, i.e. charge, which would have resulted of repeated electrooxidation and electroreduction of a diffusing mediator was overcome. However, because at the time we did not have as yet very fast "wires", the assay required ~ 30s. Through an ingenious electrochemical design, Ben Feldman succeeded later in using a fast-diffusing soluble redox mediator, that was electroreduced at the enzyme electrode but was not electrooxidized on it, and reduced thereby the time required for the assay to a few seconds (25).

TheraSense, founded in 1994, tested in human volunteers already in 1995 a miniature, subcutaneously implanted, continuous glucose monitor for diabetes management. In 1996 the company developed, tested and manufactured on a pilot scale (> 10^4 units per day) the painless home blood glucose monitor. In 1996 the company was financed by venture capital and at the end of 1996, Mark Lortz, formerly the VP of Operations of J&J Lifescan, was hired as the new CEO of the company.

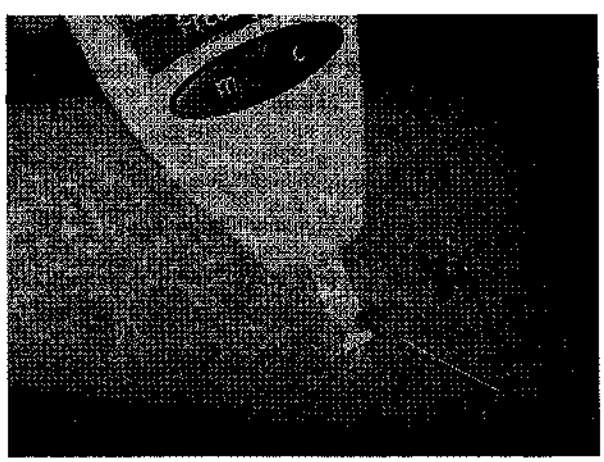

Figure 5. The first (2000 version) of the painlessly obtained 300 nL blood sample utilizing thin-layer micro-coulometric blood glucose monitor for diabetes management.

The US FDA approved painless, 300 nL blood sample analyzing, glucose monitor of TheraSense for use by diabetic people in 2000. The monitor, marketed under the name FreeStyle™, became available in the same year in the US, and within a year, in countries worldwide. In Israel, it is distributed by Geffen International. The first version of the system, and the ~300 nL blood sample it utilizes, are shown in Figure 5.

TheraSense went public in the fall of 2001, raising $120 million. In 2002 it introduced computerized, communicating, and miniature versions of the painless 300 nL micro-coulometric blood glucose monitor and in the same year started clinical trials of the first accurate, miniature, continuously glucose-monitoring system for diabetes management, based on the "wiring" of glucose oxidase. The system continuously monitors and records the glucose concentration. It has user-set hypoglycemic (low sugar) and hyper-glycemic (high sugar) alarms. Its miniature subcutaneous sensor, a plastic strip, is painlessly replaced by the patient every 3 days. By measuring not only the glucose concentration, but also its rate of change, the system warns of impending hypo- or hyperglycemia, allowing the user to take corrective action, i.e. eating or drinking to raise the glycemia, or to administer insulin to lower it, before the hypo or hyperglycemia actually occurs (Figure 6).

With the clinical trials launched and successful, the painless glucose monitor available to diabetic people worldwide, and the company well capitalized, Ephraim saw his work as completed and left TheraSense in 2002, to plan, then launch, an interventional cardiology venture, AngioScore.

By the end of 2003, TheraSense had a 7 % market share in the $ 3 billion/year US glucose monitoring market, increasing at ~ 2% / year. Also in 2003, after extensive and successful clinical trials, it submitted the clinical data to the US FDA for approval of the marketing of the continuously glucose monitoring diabetes management system.

Early in 2004 I saw my work at TheraSense as completed and I resigned from the company. In that year TheraSense was acquired by Abbott Laboratories for $1.2 billion. Following the acquisition, Abbott Diabetes Care moved its headquarters and its R&D to the campus of TheraSense in Alameda, expanding the plant and its production and increasing the number of employees.

Figure 6. The "wired" glucose oxidase based, subcutaneously implanted continuous blood glucose monitor.

Current Research on air "wired" enzyme air cathodes for batteries and on inexpensive, miniature, disposable glucose-oxygen biofuel cells

Our current research is aimed at a miniature implantable glucose-O_2 biofuel cell. Glucose and oxygen are present in all tissues of the body. The cell would produce 3-10 μW, enough to power an implanted miniature sensor and intermittently broadcasting transmitter. It would operate, after its implantation, for a few days. The biofuel cell could power a sensor-transmitter of the glucose concentration, relevant to diabetes management; or of the local elevation of temperature, indicating infection of a post-operative wound; or of the pressure difference in the central nervous system, indicating partial blockage of flow of the cerebrospinal fluid.

The cell would be simple and inexpensive (< $ 1), consisting only of a miniature "wired" GOx anode on which glucose is electrooxidized, and a miniature "wired" copper enzyme, particularly bilirubin oxidase, cathode, on which O_2 is electroreduced to water. Thus far we have built cells of 0.005 mm^3 volume, about 1/1000th of the volume of the smallest battery now manufactured and about 1/10,000th of the volume of the smallest previously reported fuel cell. They produce in one week ~ 1 joule, about 100 times more electrical energy than the highest energy density Zn-AgO or Zn-O_2 cell could produce, were it possible to manufacture such a small case-less cell. The cell consists of two 7 µm diameter 2 cm long "wired" enzyme coated carbon fibers and produces 100 nW per mm of fiber. It operates for a week at 37°C in a pH 7.2, 0.14 M NaCl, 20 mM phosphate buffer solution, and for about a day in a grape, but its life in serum is still very short, only a few hours. The cell is simple because the electrocatalysts of the anode and the cathode are far more selective than the platinum group metal catalysts of conventional fuel cells. The cell is simpler and potentially easier to manufacture than other fuel cells, which require a case, a case seal, a membrane, a membrane seal, a contained corrosive electrolyte, an anode, a cathode, a fuel container, a fuel pump and plumbing to transport the fuel to the anode compartment. In contrast, the biofuel cell has only a "wired" enzyme coated anode and a "wired" enzyme coated cathode.

While studying these cells we discovered that the "wired" laccase cathode, operating at pH 5 in a citrate buffer, is greatly superior to platinum in the four-electron electroreduction of O_2 to water. Its "wire" is shown in Figure 7. O_2 was electroreduced to water, at a true surface area-based current density of 0.5 mA cm^{-2}, at 37°C. The polarization (potential vs. the reversible potential of the O_2/H_2O half cell in the same electrolyte) of the cathode was only -0.06 V, 1/5th of the -0.40 V polarization of a smooth platinum fiber cathode, operating in its optimal electrolyte, 0.5 M H_2SO_4 (26).

This cathode could be used in simple metal-air cells, which would no longer require the corrosive, strongly alkaline solution of the presently used zinc-air batteries, potentially improving its performance and through its plastic case and seal, reduce its weight and cost.

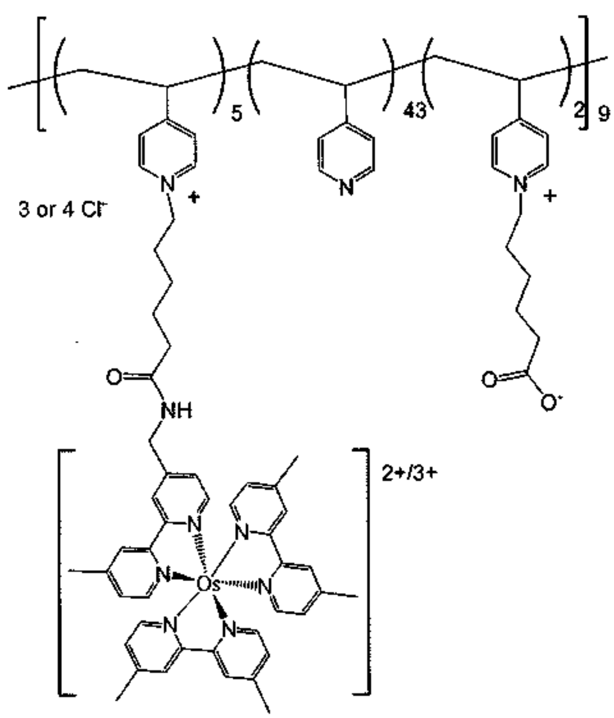

Figure 7. The "wire" of the laccase cathode, outperforming platinum in the four-electron electroreduction of O_2 to water (26).

Future drug delivering feedback loops

By switching from the presently practiced "one capsule or injection three times a day after meals" to drug delivery when and as required, it would be possible to avoid excessive drug concentration excursions (temporary under-dosing or over-dosing). Thus, by monitoring glucose concentration in diabetes, blood pressure in hypertension, or heartbeat in cardiac arrhythmia, and RF transmitting the sensor's information to a skin patch containing a few days' supply of the drug, delivering the needed

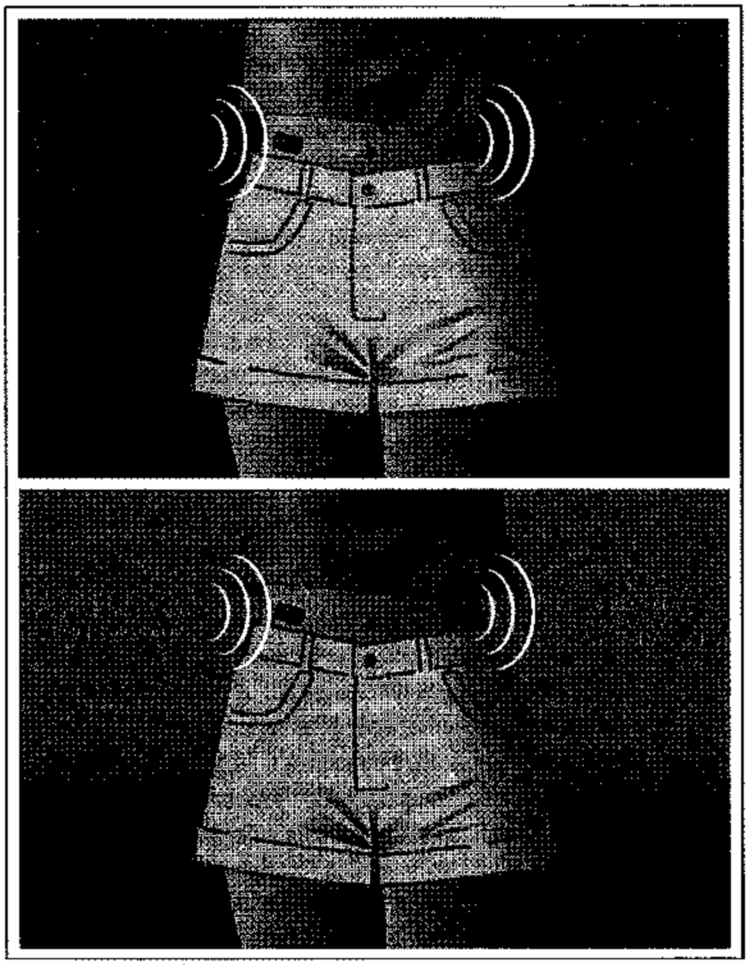

Figure 8. Foreseen future disease treating feedback loops based on two skin patches, each replaced by the patient about once a week. The feedback loops would consist of an implanted sensor-transmitter patch (left) and a drug reservoir, receiver-actuator and micropump patch (right). Initially, the sensor transmitter would be battery powered (Top). Later it might be powered by an implanted glucose-O2 fuel cell, the subject of our current research (Bottom).

drug from the skin patch, containing the drug reservoir, a receiver/actuator and a miniature drug pump, it might be possible to optimize treatment and minimize the dose of the rapidly acting drugs such as fast acting insulin in the case of diabetes, and, through the lesser doses required, reduce adverse side effects (Figure 8).

Acknowledgement

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Adam Heller

Adam Heller received his M.Sc. and Ph.D. from E. D. Bergmann at the Hebrew University, Jerusalem. In 1975 he joined ATT Bell Laboratories, where he headed from 1977 until 1988 the Electronic Materials Research Department, managing research underlying the presently practiced high-density interconnection of silicon-IC chips. He joined the engineering Faculty University of Texas at Austin in 1988.

Heller built the first inorganic liquid lasers. With J. J. Auborn he designed the lithium thionyl chloride battery, used worldwide in medical and communication systems. He established the field of electrical connection ("wiring") of redox centers of enzymes to electrodes through electron-conducting water swollen gels. Based on the"wiring" of enzymes he co-founded, with his son Ephraim, the TheraSense Inc. Company, in 1966. FreeStyle™ the world-wide available blood glucose monitor of TheraSense is the only mass manufactured (10^9 units/year) 300 nL fluidic device, requiring a blood sample so small, that it is painlessly obtained. The company's second product, its enzyme "wiring" based subcutaneously implanted continuous glucose monitor, approval of which by the FDA is pending, transmits the glucose concentration to a wireless pager-sized receiver and alerts the diabetic patients to actual or impending deviation from normalcy. With the May 2004 acquisition of TheraSense by Abbott Laboratories for $1.2 billion, Heller ended his affiliation with the company.

Heller's contributions to science are described in 230 papers and his contributions to technology in 84 issued US Patents. He is a Member of the U.S. National Academy of Engineering, a Fellow of the American Association for the Advancement of Science and a Fellow of The Electrochemical Society. He is a Guest Professor of the Collège de France and recipient of an honorary doctorate from Uppsala University in Sweden. His medals include the Spiers Medal of the Royal Society of Chemistry, UK, the Faraday Medal of the Royal Society of Chemistry, UK, the Medal of the Faculty of Engineering of the University of Tokyo and the Vittorio De Nora Medal of The Electochemical Society. He also received the Grahame Award of The Electrochemical Society, the Battery Research Award of The Electrochemical Society, the Chemistry of Materials Award of the American Chemical Society and the Reilly Award of the Electroanalytical Society. He was invited to deliver, at the 2004 Fall Meeting of American Institute of Chemical Engineers, the annual AICHE Institute Lecture.

הכנס השנתי ה-70 של החברה הישראלית לכימיה

Organized by the Department of Chemistry
of Bar-Ilan University

February 15-16, 2005
David Inter-Continental Hotel, Tel Aviv

For more detail link to Dan Knassim Ltd.:
http://www.congress.co.il/chemistry2005/

Dear Colleagues,

We are pleased to invite you to participate in the 70th Annual Meeting of the Israel Chemical Society, organized by the Department of Chemistry of Bar-Ilan University.
The meeting will be held at the Conference Center of David Inter-Continental Hotel in Tel-Aviv on February 15-16, 2005.
The interdisciplinary scientific program, which includes contributions from outstanding scientists from Israel and abroad, will promote the exchange of scientific ideas and knowledge, as well as mutual collaborations, and will enhance chemical education.
The upcoming meeting marks the 70th anniversary of The Israel Chemical Society, and we would like to take the opportunity of this special event to express the strength and the commitment of the Israeli chemical community in the research, industry and education institutions. We urge you to take part and to contribute to this most important chemical event in Israel. Please encourage colleagues and students to participate.
We believe that with the active participation of each of you we will make this meeting scientifically interesting and socially pleasant.

The Organizing Committee: Amnon Albeck, Chair, Doron Aurbach, Harold Basch, Bilha Fischer, Shmaryahu Hoz, Mordechai livne, Shlomo Margel, Avraham Nudelman, Richard Shultz

Plenary and Keynote Lecturers

Markus Antonietti
Max Planck Institute, Potsdam, Germany
Jay S. Siegel
University of Zurich, Switzerland
J. Fraser Stoddart
UCLA, Los Angeles, CA, USA

Aryeh Frimer, Bar-Ilan University
Ehud Keinan, Technion

Winners of the ICS Prize

Robert Benny Gerber, Hebrew University
Shlomo Rozen, Tel Aviv University

אוניברסיטת בן-גוריון בנגב
מכון ויצמן למדע

"MEMBRANES: FROM BIOENERGETICS TO DESALINATION"

SYMPOSIUM IN HONOUR OF THE 80TH BIRTHDAY OF PROF ORA KEDEM

Sunday, October 17, 2004
SCHMIDT AUDITORIUM

Opening Remarks

Chair: Doron Lancet, Weizmann Institute of Science
Gabi Ben-Dor, Head of the Institutes for Applied Research, Ben Gurion University
Ilan Chet, President Weizmann Institute of Science
Ephraim Katzir, Weizmann Institute of Science, Israel

Remarks

George Belfort, Rensselaer Polytechnic Institute, USA (plenary)
"Thoughts on Ora Kedem, the Scientist-Technologist" and
"Why Fundamental Science Matters in Advancing (Membrane) Technology"

Marc Wilf, Hydranautics, USA
"Optimization of Seawater Reverse Osmosis System Design"

Rafi Semiat, Technion, Israel
"Directions in Nano Technologies for Desalination"

Joshua Jortner, Tel Aviv University, Israel
"Some Facets of Electron Transfer"

Robert Blumenthal, National Cancer Institute (Frederick), NIH, USA
"Membranes: From Separation to Fusion"

Haim Garty, Weizmann Institute of Science, Israel
"Regulation of Epithelial Transport. From Thermodymanic Predictions to Molecular Details"

Roy Caplan, Weizmann Institute of Science, Israel
"The Bacterial Flagellar Rotary Motor: From Nonequilibrium Thermodynamics to Mechanism, or Opening the Black Box"

Michael Elbaum, Weizmann Institute of Science, Israel
"Polymers and Pores: the Nuclear Pore and Nuclear Transport"

Matthias Wessling, University of Twente, Netherlands
"Polyelectrolytes - An Infinite Size Playground for Membrane Scientist and Engineers?"

Charles Linder, Ben Gurion University, Israel
"The History of Nanofiltration Membranes from 1960 until the Present"

Ora Kedem – Closing Remarks

שלב הגמר של ה"כימיאדה" לשנת תשס"ד (2003-04)

מירה כץ, הפקולטה לכימיה, הטכניון, חיפה

שלב הגמר של האולימפיאדה הארצית לכימיה, לתלמידי כתות י"א-י"ב בבתי-הספר התיכוניים התקיים בפקולטה לכימיה בקרית הטכניון, חיפה, בתמיכת משרד החינוך ובשיתוף החברה הישראלית לכימיה.

ביוזמתם של פרופ' אהוד קינן, דקן הפקולטה לכימיה, ופרופ' גבריאל קוונצל, האחראי האקדמי על ה"כימיאדה", הורחב לראשונה שלב הגמר ונערך במשך יומיים, כולל אירוח מלא של התלמידים במסגרת זו. לשלב זה, שהתקיים לאחר חופשת הפסח (15-16לאפריל 2004), העפילו 23 תלמידים מכלל בתי- הספר התיכוניים בארץ. לראשונה נכללו בו הרצאות מדעיות שהוכנו ע"י המתמודדים בנושא בתחום הכימיה. ההרצאות ניתנו בנוכחות קהל רב שכלל מעריכים מסגל הפקולטה לכימיה, מורים וחברים. ההרצאות היו בעלות אופי של כינוס מדעי לכל דבר, היוו אטרקציה של ממש וזכו להצלחה רבה. התלמידים נבחנו בבחינה בכתב ובבחינת מעבדה, תחת השגחת צוות מסגל הפקולטה. הניסויים השונים בוצעו על ידי המתמודדים במעבדות הפקולטה לכימיה, ולרובם זו הייתה התנסותם הראשונה במעבדה. במהלך התחרות ניתנה להם הרצאה ע"י פרופ' מויסייב בנושא:"מכאניקה קוונטית: מעקרונות יסוד עד לטכנולוגיה". שלב הגמר זכה להצלחה רבה והתלמידים ציינו בפנינו, בעל פה ובכתב, כי זו הייתה חוויה אדירה עבורם למרות הקושי וההשקעה הנוספים שנדרשו מהם בלימוד החומר והכנת ההרצאות, ובהתחשב בעובדה כי הם נמצאים בתקופת הבגרויות - התחרות **"הייתה שווה כל רגע"**.

כשבועיים לאחר מכן, התקיים טקס רב משתתפים לציון סיום "כימיאדה" תשס"ד (2003-4) בנוכחות נציגי הטכניון, משרד החינוך וסגל הפקולטה לכימיה, אשר נתנו את ברכתם לתלמידים שהעפילו לשלב הגמר. בטקס הוקרנה מצגת אשר סקרה את חוויות התלמידים, ניתנו הרצאות מאתגרות מפי פרופ' אהוד קינן, דקן הפקולטה לכימיה, ופרופ' מויסייב. נשמעו ברכות מפי פרופ' קוונצל, האחראי האקדמי של ה"כימיאדה", פרופ' שפייזר, נשיא החברה הישראלית לכימיה, פרופ' כפתורי, יו"ר המרכז לחינוך קדם אקדמי ופרופ' ברוקשטיין, דקן לימודי מוסמכים.

פרסים הוענקו לשלושת המקומות הראשונים, ובנוסף הוענקו 2 פרסי הצטיינות ו- 2 פרסי השתתפות במחנה קיץ למשתתפים הצעירים עפ"י הפירוט שלהלן. כמו כן חולקו פרסי השתתפות לכל התלמידים שעלו לגמר "כימיאדה" תשס"ד (2003-4). נא לשים לב כי שניים מן הזוכים הם תלמידי כתות נמוכות יותר מכתות י"א וי"ב, שהישגיהם בולטים ביותר.
תעודות לבתי-ספר מצטיינים, אשר שלחו תלמידים רבים ל"כימיאדה", ניתנו ע"י גב' לקריץ, מנהלת המחלקה לנוער שוחר מדע במשרד החינוך; ותעודות הערכה למורים מצטיינים מאותם בתי-ספר, אשר קידמו את נושאי הכימיה והכינו את תלמידיהם לתחרות, ניתנו ע"י ד"ר ברנע מפקחת על הוראת הכימיה במשרד החינוך.

ה"כימיאדה" לשנת תשס"ד (2003-4) הוכתרה כהצלחה אדירה, ופותחת פתח בפני הבוגרים לבחור בלמודי מקצועות המדעים, בכלל, ובכימיה בפרט. התחרות נותנת תנופה ללמודי הכימיה, בתקווה שתעודד עוד ועוד תלמידים לקחת חלק בחוויה.

רשימת הזוכים ב"כימיאדה" תשס"ד (2003-4)	כתות י"א	כתות י"ב
מקום ראשון	**טל פריצקר (כתה י')** תיכון הנדסאים, אוניברסיטת תל אביב	**נדב וקסלר** תיכון ע"ש יצחק בן צבי, קרית אונו
מקום שני	**ארז שריג** תיכון למדעים ולאומנויות, ירושלים	**דן דבירי (כתה ח')** תיכון עירוני ד', תל אביב
מקום שלישי	**אלכס רויטנברג** תיכון עירוני ע"ש פנחס אילון, חולון	**אסף הראל** גימנסיה עברית הרצליה, תל-אביב

הצטיינות

לודמילה מרקין (כתה י״ב) תיכון עירוני א׳ חיפה

פבל ברמן (כתה י״ב), מקיף אורט קרית מוצקין

מחנה קיץ

דן דבירי (כתה ח׳) תיכון עירוני ד׳ תל אביב

טל פריצקר (כתה י׳) תיכון הנדסאים אוניברסיטת תל-אביב

מכתבי הערכה למורים מצטיינים ותעודות הצטיינות לבתי-ספר

יעל ארנרייך תיכון רבין קרית ים

רחל שפירא תיכון ע״ש יצחק בן-צבי קרית אונו

זהבה דיטל תיכון מקיף אורט קרית מוצקין

רוזנה גפני כפר הנוער ניר העמק עפולה

חטיב נאיל תיכון יפיע

זהר דינור בי״ס למדעים ולאומנויות ירושלים

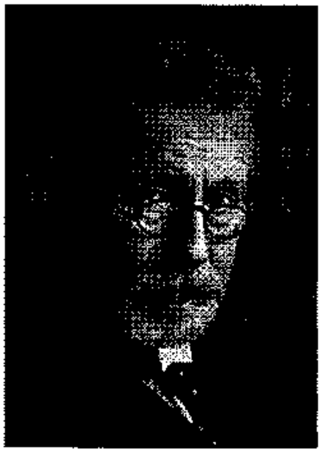
בלה וקסלר תיכון עירוני א׳ חיפה

רייר אלה עירוני ע״ש פנחס אילון חולון

אדלה גלפרין תיכון הנדסאים אוניברסיטת תל אביב

PAUL EHRLICH (1854-1915) AND THE HEBREW UNIVERSITY

Bob Weintraub, Director of the Libraries, Sami Shamoom College of Engineering, Beersheva and Ashdod. bob@ sce.ac.il



"More than any other man, I think, Ehrlich was responsible for the tremendous revolution in the medicinal treatment of disease which has taken place during the last half century. He had a large share of the responsibility for making immunology a progressive, experimental science. In retrospect however, his immunological work appears to have been a diversion from, or an opportunist extension of, the main line of his researches. Even from his student days, his mind appears to have permeated and his activities directed by the idea of therapeutics based upon specific chemical affinities; and the line of development appears to be direct, from Ehrlich's early work on the use of dyes as micro-chemical reagents, and on the oxygen needs of the tissues, through salvarsan to the sulphonamides, the antibiotics, and all the great modern wealth of directly curative remedies". (Sir Henry Dale, 1954)

Paul Ehrlich was born in 1854 into a Jewish family in a town near Breslau, in Silesia. He studied at university at Breslau, Strassbourg, Freiburg-im-Breisgau and Leipzig, where in 1878 he earned his medical degree with a thesis titled "Contributions to the Theory and Practice of Histological Staining. Part I. The Chemical Conception of Staining; Part II: The Aniline Dyes in a Chemical, Technological, and Histological Connection."

Paul Ehrlich in a tribute to his teacher Heinrich G. Waldeyer- who by observing the staining technique of the young Ehrlich recognized a medical student of unusual talent- wrote 40 years later:
"So it was that you soon recognized how very interested I was in chemical questions, and you gave me suggestions and hints for trying out my abilities on different dyeing assignments. I still remember my delight when I was able to attempt a somewhat tricky haematoxylin staining and show you the very successful preparations. It was only through you that I was awakened to the love and understanding of dyes that have accompanied me throughout my career and become determining factors in my life. Although modern chemotherapy has established itself in science and medical practice, its origin goes back to the histological stainings; so it is no coincidence that the first chemotherapeutic experiments that ended so promisingly were conducted with dyes-methylene blue or trypan red. Initially, therefore, chemotherapy was a "chromotherapy".
The word "chemotherapy" was coined by Ehrlich. (Quotations of Paul Ehrlich and August von Wassermann are taken from Paul Ehrlich, Scientist for Life, by E. Bäumler).

August von Wassermann (1866-1925) (Ehrlich's friend and colleague, best known for having developed together with Neisser and Bruck in 1906 a serological diagnostic test for syphilis which still bears his name):
"Under Koch's directorship there were men like Behring, Brieger, Ehrlich, Pfeiffer, Proskauer, and a number of younger high-caliber graduates who have since made their names in the world of science. If a comparison of any sort is appropriate among such great men, I have to say that Paul Ehrlich was the champagne among the wines. While Koch appeared as the eternally serious-minded academic who thoughtfully weighed and stressed every word, disdaining all theory, observing only what was factual, and describing it in studied terseness, Ehrlich was literally bubbling over with brilliant ideas and views on the further development of medicine.

In a scientific discussion with Ehrlich, one had the feeling that in his mind's eye he truly saw into the most profound secrets of the biological and chemical processes of cellular life, even if, at that particular moment, he was not yet able to provide experimental proof for his views. One instinctively sensed that this man's mental perception was generations ahead of the actual development of medicine-a pioneer and guide in the truest sense of the term.
In keeping with this fascinating colorful personal impression was the appearance of his workplace, his laboratory. For anyone taking a look into these two rooms on the second floor of the building facing Schumannstrasse, the sight was unforgettable. The visitor was confronted with a symphony of colors; without exaggeration, thousands upon thousands of glass bottles stood around, all filled with the brightest aniline dyes. Ehrlich, who by then had already realized that the relationship of all manner of organs and parts of organs to certain chemical substances could readily be made visible by the use of aniline dyes (a realization through which he had created the entire diagnostic system for blood corpuscle diseases as a young man), was involved in a highly stimulating exchange of ideas with the coal-tar industry. Thus, the industry sent him a sample of each new dye as soon as it appeared, and it was from that time onwards that his lifelong friendships and profound admiration for the creative geniuses and great names in the German dye industry derived-people like Duisberg, the late Professor Laubenheimer, A. V. Weinberg, and others". (Arthur von Weinberg was Jewish and was to die in Theresienstadt.)

Ehrlich:

"We have, in active and passive immunization, a powerful weapon which has already shown its effectiveness in many infectious diseases and always will do so. What makes Serumtherapy [immunotherapy] so extraordinarily active is the fact that the protecting substances of the body are the products of the organism itself, and that they act purely parasitotropically [substances that bind or anchor to the parasite and kill them] and not organotropically [substances that bind or anchor to organs in the human body]. Here we may speak of 'magic bullets' which aim exclusively at the dangerous intruding parasites strangers to the organism, but do not touch the organism itself and its cells. Serumtherapy is therefore obviously, wherever it can be carried out, superior to any other mode of action!

But we know of a number of infectious diseases, especially those which are caused by protozoa, where Serumtherapy either does not work at all or only with much loss of time. I call attention especially to malaria, to the diseases caused by trypanosomes, and perhaps a number of infections caused by spirilla must be counted here too. In these cases chemical substances must come to aid the treatment! Instead of Serumtherapy, Chemotherapy must be used.

In order to use Chemotheapy successfully, we must search for substances which have an affinity to the cells of the parasites and a power of killing them greater than the damage such substances cause to the organism itself, so that the destruction of the parasites will be possible without seriously hurting the organism. This means that we must strike the parasites and the parasites only, if possible, and to do this, we must learn to aim with chemical substances! The methods which have been worked out offer the possibility of obtaining, by chemical synthesis, a rich variety of those chemical substances. "

In 1908 Paul Ehrlich and Ilya Mechnikov were honored for their work in immunology by the award of the Nobel Prize in Physiology and Medicine.

On June 8, 1909, the historic experiment was carried out in which rabbits with syphilitic inflammation of the cornea (syphilitic keratitis) were injected with the experimental compound numbered '606'. The corneas healed rapidly. On April 19, 1910, Prof. Ehrlich reported on the use of oxy-diamino-arseno-benzene-dihydrochloride for the treatment of syphilis. Salvarsan or '606' destroys the microorganism Treponema pallidum, the spirochaeta which causes syphilis. Prof. Konrad Aalt of Uchtspringe, who was the first to report on the treatment of syphilitic patients with the new compound, said, "To begin, I was totally unable to grasp or believe that one single injection had brought about such a wonderful reversal in the condition of cases which had previously proved obstinate and refractory in the extreme." Two generations later when penicillin was discovered it replaced salvarsan and other arsenical drugs as the treatment of choice, which it remains today.

Chaim Weizmann and the Hebrew University.

In 1913 Chaim Weizmann met with Baron Edmund de Rothschild to discuss plans for a proposed Hebrew University in Jerusalem. One of the conditions for support laid down by the Baron was to "get the support of some great Jewish scientists, Paul Ehrlich, for example."

Weizmann:

"Ehrlich was then at the very height of his phenomenal career, and utterly unapproachable by ordinary mortals. I had heard this, moreover, that he took little interest in Jewish matters, and indeed in any matters outside the scope of his medical research. I was at a loss for a means of contact, until I bethought myself of an old friend in Berlin, Professor Landau, who was related to Ehrlich by marriage. In March of 1914 I made a special journey to Berlin, sought out Landau and said, in effect, that I would be grateful to him for the rest of my life if he would telephone his illustrious relative in Frankfort and arrange an interview for me.

Professor Landau acceded to the request, very doubtful though he was of the feasibility of my plans. I would be lucky, he said, if Ehrlich gave me five minutes of his time; and luckier still if I could persuade him to detach his thoughts from his scientific affairs long enough to get him to understand what I was talking about; for Ehrlich was utterly impervious to outside influences, especially in his laboratory, where I proposed to visit him.

I was not in a very sanguine state of mind when I mounted the steps of the Speyer Institute, in Frankfurt. In spite of my public activities, I was by nature shy, and hanging about in the antechambers of the great was not in my line. Not that on this occasion I had much hanging about to do. The difficulty turned out to be of another character, for the rather extraordinary interview which Ehrlich granted me quite promptly nearly turned out to be a piece of propaganda for Ehrlich's scientific theories rather than for the Hebrew University.

I have retained an ineradicable impression of Ehrlich. His figure was small and stocky, but he had a head of great beauty, delicately chiseled; and out of his face looked a pair of eyes which were the most penetrating that I have ever seen-but they were eyes filled with human kindness.

Ehrlich knew that I was a chemist, but he did not know what I was coming to see him about. He therefore plunged at once into the subject of his researches. He introduced me to some of his assistants (since become famous) and especially to his rabbits and guinea pigs. Then he took me on a fairly comprehensive, if rapid, tour of his laboratory, talking all the time and performing test-tube experiments as we went along.

It was fascinating; but it would have been more so if I had not been wondering how I could switch the conversation to the purpose of my visit. I listened respectfully while he unfolded part of his theory of chemistry-for he was a great chemist as well as a great medical man. He spoke of chemistry as of a weapon with which one could shoot at diseases. He put it this way: if you have your chemistry properly applied, you can aim straight at the cause of a sickness. By 'properly applied' he meant the creation of a certain group in a compound with a specific affinity for certain tissues in the human body. Such a compound, injected into the body, unites with those tissues only. He gave me an instance: if one injected a certain dyestuff called methylene blue in an animal-say a mouse-and afterwards cut open the body, one would find that the whole body had remained unaffected. In methylene blue the grouping of the atoms makes it a specific for the nervous tissues. But suppose methylene blue had a curative value for certain nervous diseases; you could then, as it were, aim for the nerves without affecting the rest of the body. He developed this theory to me-it is obsolete now, but was new then-with great eloquence and excitement as I followed him about the laboratory.

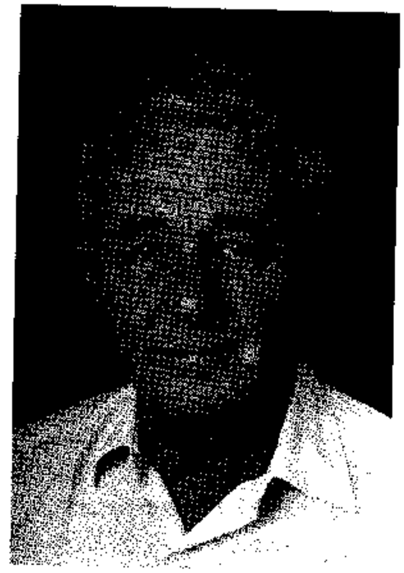
At last I took my courage in my hands, and steered the conversation cautiously in my direction: I mentioned that I had come to see him, at the suggestion of Baron Edmond de Rothschild of Paris, on the subject of the Hebrew University of Jerusalem. He listened for a few moments, and then exclaimed: 'But why Jerusalem?' I was off at last! I set out with considerable energy to explain why Jerusalem was the one place in all the world where a Hebrew University could and ought to be established. Somehow I caught his interest, and my excitement rose as I saw that he was following my argument with increasing attention. It was perhaps twenty minutes before he interrupted me, saying: "I am sorry, we must stop now. After I have seen my patients, we shall go home and continue".
Then, excitedly, he pulled out his watch and exclaimed:
"You have kept me nearly an hour. Do you know that out there, in the corridor, there are counts, princes and ministers who are waiting to see me, and who will be happy if I give them ten minutes of my time?"
He said it good-naturedly, and I replied:
"Yes, Professor Ehrlich, but the difference between me and your other visitors is that they come to receive an injection from you, and I came to give you one".

We continued our conversation later that evening at his house, where I met Mrs. Ehrlich, a typical sweet German Hausfrau, who was always scolding her husband for his untidiness, and for his ceaseless smoking. [Hedwig Ehrlich managed to flee Nazi Germany by way of Switzerland for the United States, where she died in 1948.] Ehrlich was literally never without a cigar in his mouth, and I think it was this habit that killed him. By the time I left him he promised to see Baron Edmond on his next visit to Paris, which was to take place in a few days, and to give him his answer.

I stayed on for a little while in Germany, and got back to Manchester for the first day of Passover. I found waiting for me an enthusiastic telegram from Ehrlich. He was in Paris; he had talked to the Baron; and he had consented to serve on the University Committee. It was a tremendous scoop for me."

The other members of the committee were the Baron's son, James de Rothschild of London, to serve as his representative; Prof. Otto Warburg of Berlin; Prof. Landau's son Edmund, the mathematician then at Gottingen and later for a short time professor at the Hebrew University; Martin Buber; and Achad Ha-am. The first official meeting of the committee was scheduled to be held in Paris on August 4, 1914. World War I broke out on July 14, and that meeting was postponed. Paul Ehrlich died in 1915. He left funds in his will towards the Nordau Institute, one of the original ideas for what evolved into the Hebrew University. Prof. Ehrlich was all of his life concerned about Israel. He was an active member of Jewish groups that worked for settlement and for the improvement of health conditions in Palestine.

On Mount Scopus, in July of 1918, twelve foundation stones symbolizing the Tribes of Israel were laid for the Hebrew University of Jerusalem.
Chaim Weizmann delivered a moving speech at the ceremony, in part:
"It seems at first sight paradoxical that in a land with so sparse a population, in a land where everything still remains to be done, in a land crying out for such simple things as plows, roads, and harbors, we should begin by creating a center of spiritual and intellectual development. But it is no paradox for those who know the soul of the Jew. It is true that great social and political problems still face us and will demand their solutions for us. We Jews know that when the mind is given fullest play, when we have a center for the development of Jewish consciousness, then coincidentally we shall attain the fulfillment of our material needs. In the darkest ages of our existence we found protection and shelter within the walls of our schools and colleges, and in devoted study of Jewish science the tormented Jew found relief and consolation. Amid all the sordid squalor of the Ghetto there stood schools of learning where numbers of young Jews sat at the feet of our rabbis and teachers. Those schools and colleges served as large reservoirs where there was stored up during the long ages of persecution an intellectual and spiritual energy which on the one hand helped to maintain our national existence, and on the other hand blossomed forth for the benefit of mankind when once the walls of the Ghetto fell. The sages of Babylon and Jerusalem, Maimonides and the Gaon of Wilna, the lens polisher of Amsterdam and Karl Marx, Heinrich Heine and Paul Ehrlich, are some of the links in the long, unbroken chain of intellectual development."



פרופסור מרדכי פולמן 1923-2004

פרופ׳ מרדכי פולמן נולד בלודז׳ שבפולין בשנת 1923 ועבר את מלחמת העולם השניה כבחור צעיר במחנות ריכוז בפולין. לאחר המלחמה השלים את לימודיו וקיבל תואר M.Sc. בהנדסה כימית מהפוליטכניון של לודז׳ ב- 1950. מיד לאחר מכן עלו פולמן ורעייתו לארץ. בשנת 1955 סיים את לימודי הדוקטורט במחלקה לכימיה בטכניון, והיה הדוקטורנט הראשון של הפקולטה לכימיה. לאחר מכן נסע לקיימברידג׳ באנגליה וסיים שם דוקטורט נוסף במחלקה לכימיה קולואידית. הוא חזר לטכניון כחבר סגל, ובשנת 1967 הגיע לדרגת פרופסור מן המנין. הוא נבחר למחזיק הקתדרה על שם יעקב דורי, היה ראש המעבדה לכימיה פיזיקלית, ודיקן הפקולטה לכימיה בשנים 1976-79. היה ממקימי המכון למצב מוצק ויושב הראש הראשון שלו.

פרופ׳ פולמן היה מורה מעולה שחינך דורות של סטודנטים בכימיה פיזיקלית, כימית השטח ותרמודינמיקה. הוא הדריך יותר מ-30 דוקטורנטים ומסטרנטים, שרובם תופסים כיום עמדות בכירות במשק ובאקדמיה בארץ.

הוא יסד ופיתח בטכניון את תחום כימית השטח כנושא מחקר בסיסי, חדש, בין-תחומי, ובעל השלכות טכנולוגיות מרחיקות לכת בעיקר בהקשר לקטליזה הטרוגנית. זהו שטח שלא היה קיים לפניו בשום מוסד אקדמי אחר בארץ.

השילוב של חלוציות וחזון בבחירת נושאי המחקר עם כושר מנהיגות, משך אליו תלמידים מצטיינים רבים שעמם ביצע את רוב מחקריו. מסוף שנות השישים עד אמצע שנות השמונים עסק בחקר תופעת הספיחה של גזים על פני גבישי מתכת יחידים בשיטה מיקרוסקופית חדשנית לזמנו - שיטת הפליטה האלקטרונית מושרית-שדה.

בתחילת שנות השמונים הקים פולמן, ביחד עם חוקרים אחרים מהטכניון, את המעבדה המתקדמת לחקר השטח במכון למצב מוצק בטכניון שהייתה בזמנו היחידה מסוגה בכל המוסדות להשכלה גבוהה במדינה. במעבדה שיועדה בעיקר למתן שירותים, כולל לגורמים מהתעשייה, בוצע גם מחקר בסיסי, וכך הורחב מחקר הקטליזה הבסיסי שלו בפקולטה לכיוונים חדשים ומפתיעים, תוך שימוש אופטימלי בכל שיטות המדידה המתוחכמות שבמעבדה.

לפרופ׳ מרדכי פולמן הייתה תמיד ראיה רחבה יותר מאשר הבעיה המדעית הספציפית שאיתה התמודד. הוא היה מדען לדוגמה ואדם שלם. כדיקן הוא הצליח להביא לפקולטה חברי סגל צעירים ומוכשרים והיה לכולנו מודל לחיקוי.

יהי זכרו ברוך.

פרופ׳ אהוד קינן
דיקן הפקולטה

Prof. Mordechai Folman 1923 - 2004

Prof. Mordechai Folman was born in Lodge, Poland in 1923. During World War II he was in the Nazi concentration camps. After the war he completed his M.Sc. studies in chemical engineering at the polytechnic school of Lodge in 1950. He then immigrated to Israel with his wife. He continued his studies in the Chemistry Department of the Technion and was the first student to be awarded a Ph.D. in chemistry at the Technion. He then went to Cambridge, England to receive another Ph.D. from the Department of Colloidal Chemistry. He returned to the Technion as a Faculty member and was promoted to Full Professor in 1967. He held the Yaacov Dori Chair, and served as Dean of the Faculty of Chemistry in 1976 – 1979. He was also involved in establishing the Institute for Solid State research and acted as its first Chairman.

Prof. Folman was an excellent teacher who educated many generations of students in physical chemistry, surface chemistry and thermodynamics. He was the mentor of over 30 Ph.D.and M.Sc. students, most of them holding major positions in industry and academy. He established the area of surface chemistry in the Technion, as a new subject of basic inter-disciplinary research, with far reaching applications especially in heterogenous catalysis. This was a new area of research that did not exist in any other academic institution in the country.

The combination of originality and long range outlook in choosing research subjects attracted outstanding students to his group. From the beginning of the 60s to the middle of the 80s he dealt with problems of adsorption of gases on single metal crystals, using the novel spectroscopic methods. In the early 80s, he established together with other scientists, the Laboratory for Surface Research in the Institute of Solid State in the Technion. This Laboratory was unique in the whole country. The Laboratory was designed to give services to various research groups in the academy and in industry. It was also a center for basic research and it widened the scope of basic catalysis research to new and exciting directions, using the very advanced analytical tools of the Laboratoty.

Prof. Mordechai Folman had a wide outlook on scientific research. He was an outstanding scientist and a perfect human being. During his tenure as Dean of the Faculty he succeeded in attracting bright young faculty members and was a role model for all of us.

Prof. Ehud Keinan, Dean

Prof. Shimon Shatzmiller 1994 -1997
Born in 1942 in Haifa.
He received his D.Sc. from the Technion in 1978. He is presently a Professor and Head of the Department of Biological Chemistry in the Acvademic College of Judea and Samaria College in Ariel.
His research includes synthesis of imaging materials for radiography, unnatural amino acids and their inclusion in peptides, synthesis of intermediate compounds for the drug industry and application of organo-lithium compounds.

Prof. Arnon Shani 1997-2003
Born in 1935 in Nes-Ziona.
He received his Ph.D. from the Weizmann Institute in 1965. After being a post-doctoral fellow in the University of Chicago and research fellow in the Hebrew University he joined the chemistry faculty of Ben-Gurion University in the Negev, as one of the founders, in 1968. He served as Head of Department, Deputy Rector of the University, and Director of the Applied Research Institutes.
His areas of research include new derivatives of Hohova waxes and devising uses for these derivatives; chemistry and entomology of pheromones and their application in agriculture. In connection with the latter activity he started a company named PheroCap (together with Prof. Shlomo Magdassi from the Hebrew University). The aim of the company is to produce ecologically accepted products for confusing and interrupting the chemical communication of pests by using pheromones.

Prof. Shammai Speiser 2003 -
Born in Haifa in 1941.
He received all his academic degrees from the Technion. After post-doctoral work in Holland, he joined the Faculty of Chemistry in the Technion in 1973, where he is a Professor and holds the Joseph Freund Chair.
During the years 1987 to 1990 he was the Head of the Youth Activities in the Technion, during 1991 to 1994 he was the Dean of the Chemistry Faculty, and presently he is the Dean of the Division of Continuing Education.
He was the recipient of the New England Prize in 1933, the Research Prize of the ISPS in 1997, the Traub Prize in 2001 and the Medal of the University of Lion in 2002.
His research areas include lasers in chemistry, photophysics of organic molecules and molecular optoelectronics and electronics.

Dr. Ralph Haber 1980-1984
Born in 1927 in Rumania. Immigrated to Israel in 1940.
He received his Ph.D. in 1956, from the University of Zurich, Switzerland.
He served for a number of years as Lecturer in the Chemistry Department of the Technion, and then moved to the pharmaceutical Company Abic (which was later acquired by Teva), as the Director of Research and Development.
He developed a new drug "Avimsten100" for treatment of infections in cattle, as well as other drugs.

Prof. Haim Levanon 1984 -1987
Born in 1938 in Jerusalem.
He received his Ph.D. in 1969, from the Hebrew University. He joined the Chemistry Faculty of the Hebrew University in 1972, was Head of Physical Chemistry Department and Director of the Farkas Center for light-induced processes.
His main areas of research are EPR spectroscopy, photosynthesis, photochemical and photophysical processes in liquid crystals, and applied aspects of spin polarization towards maser action at room temperature.

Prof. Dan Meyerstein 1987-1991
Born in 1938 in Jerusalem.
He received his Ph.D. from the Hebrew University in 1965. He served as Head of the Chemistry Department, in the Nuclear Research Center – Negev, in Dimona. He is presently a Professor of Chemistry at Ben-Gurion University of the Negev and President of the Academic College of Judea and Samaria, in Ariel.
His research areas are radiation chemistry, bio-inorganic chemistry, metal complexes in unusual oxidation states, redox reactions and kinetics of free radicals.

Prof. Alfred Hassner 1991-1994
Born in 1930 in Romania.
Survived the Holocaust. Studied in Vienna and then in the USA where he received his Ph.D. from the University of Nebraska, in1956, followed by postdoctoral studies at Harvard. Served as professor of chemistry at the University of Colorado and then at the State University of New-York in Binghamton.
Immigrated to Israel in 1983. After a year at the Weizmann Institute he moved to Bar-Ilan University as a professor of chemistry.
His research includes new methods in organic synthesis, stereoselective and regioselective synthesis of organo-nitrogen compounds, cycloadditions and new heterocycles, bio-organic and bioactive molecules.

Prof. Shalom Sarel 1960-1964
Born in 1918 in Jerusalem.
He received his Ph.D. from the Hebrew University in 1945, after carrying out his research at the Sieff Institute in Rehovoth. He became a Professor of organic chemistry at the Hebrew University and later established the Department of Medicinal Chemistry of the Medical School in the University.
His major research field is pharmaceutical chemistry.

Prof. David Ginsburg 1964-1969 (See above)

Prof. Michael Cais 1969-1972
Born in 1924 in Rumania. Immigrated to Israel in 1941.
He received his B.Sc. from the University of Leeds, England, in 1951 and his D.Sc. from the Technion in 1955. He joined the Chemistry Faculty of the Technion, in 1958 and was Dean of the Faculty during the years 1972-1976.
His areas of research include homogenous catalysis in chemical and biological systems using organo-metallic complexes, medical diagnosis, and separation technology.

Prof. Saadya Amiel 1972-1974
Born in 1930 in Israel. Passed away in 1978.
Received his Ph.D. from the Hebrew University in 1955, after carrying out his research at the Weizmann Institute. He later became the Head of the Nuclear Chemistry Department at the Soreq Nuclear Center in Yavne, and Professor of Nuclear and High Energy Chemistry at the Hebrew University.
His research was in the areas of radioactive isotopes and radiation chemistry.

Prof. David Lavie 1974-1977
Born in 1919 in Egypt. Passed away in 2003.
He received his Ph.D. from the Hebrew University in 1945, after carrying out his research at the Daniel Sieff Research Institute, Rehovoth. He later became a Professor of organic chemistry at the Weizmann Institute.
His main research was in the area of natural products as drugs for viral diseases and for cancer.

Prof. Michael Albeck 1977-1980
Born in 1934 in Berlin.
He received his Ph.D. from the Hebrew University in 1962. After a number of years of work in the Fiber and Forest Products Institute and in the Mekorot Company, he joined the Department of Chemistry in Bar-Ilan University, Ramat-Gan. He served as Dean of the Science Faculty during 1967-1969 and also in 1973-1975, Rector of the University in 1982-1986, and as President of the University in 1986-1989.
His areas of research include organo-tellurium compounds in synthesis and as compounds enhancing the immune system.

Dr. Yehuda Hirshberg 1948 - 1955
Born in Poland in 1902. Passed away in1960.
He arrived in Israel in 1923 and joined a kibbutz as a pioneer. He then started his studies at the pre-faculty of sciences of the Hebrew University in Jerusalem.
He graduated unofficially(as the University was not recognized at the time) in 1928.
He later received his Ph. D. degree from the University of Brussels in 1931. After working there for a couple of years, as a Research Assistant, he joined, in 1933, the newly established Daniel Sieff Research Institute as the first and only physical chemist.
His field of research was photochemistry. In 1950 he discovered photochromism and the phenomenon of photochemical memory, which won him world-wide recognition.
He received the Weizmann Prize in 1953.

Prof. David Ginsburg 1955-1957
Born in 1920 in the USA. Immigrated to Israel in 1948. Passed away in 1988.
He joined the Weizman Institute in 1948, where he achieved the total synthesis of morphine. In 1954 he moved to the Technion where he established the Faculty of Chemistry and was the Dean of the Faculty for a number of years. He also served as the Acting President of the Technion in 1961. In addition he was active in a number of public functions in the Technion and in the national academic establishment.
He discovered the field of propelanes in organic chemistry and published about hundred papers in this field.
Prof. Ginsburg was a member of the Israel Academy of Science and Humanities, the recipient of the Weizman Prize in 1954, the Rothshield Prize in 1965, the Israel Prize for the Exact Sciences in 1972 and the Hoffman prize, from the German Chemical Society, in 1983.

Dr. Herbert Bernstein 1957-1959
Born in 1914 in the USA. Immigrated to Israel in 1947. Passed away in 2001.
He received his Ph.D. from Pennsylvania State University and his post-doctoral work was at Princeton. He joined the Weizmann Institute in 1947 and served in the Israeli Army Science Unit during the War of Independence.
He was a pioneer in the establishment of the chemical industry in the country. He founded the detergents and chemicals company "Kadima" in Haifa in 1950, and later became the Director of Research and Development of the Fertilizers and Chemicals Company. His last appointment was as the Head of the Research and Development Organization of the Technion.

Prof. Felix Bergmann 1959-1960
Born in 1908 in Germany. Immigrated to Israel in 1933. Passed away in 2002.
Was one of the first chemists in the Daniel Sieff Research Institute in Rehovoth. He established the Department of Pharmacology in the Medical School of the Hebrew University in Jerusalem.
His main research areas were synthetic and pharmaceutical chemistry.

Chairmen and Presidents of the Israel Chemical Society since its establishment 70 years ago

In 1933, a group of chemists in Eretz-Israel (Palestine) decided that they have to get organized in order to find solutions for their unemployment problem, caused by the flood of immigrants from Europe. They met at the campus of the Hebrew University on Mount Scopus in Jerusalem. At this meeting they announced the establishment of the "Union of Chemists in Eretz-Israel (Palestine)" and decided on the aims and the by-laws of the Union. Prof. Mordechai Bobtelsky, of the Hebrew University, was elected as the first Chairman of the Union.

A few years after the establishment of the State of Israel, the name of the Union was changed and it is now known as the "Israel Chemical Society". The first President of the Society, in its present form, was Prof. Shalom Sarel, of the Hebrew University.

In commemoration of the 70th anniversary of the Union, we present here the list of all the Chairmen and Presidents of the Society, since its establishment, and we herby want to express our appreciation and thanks for their contributions.

The Union of Chemists in Eretz-Israel 1933 - 1960

Prof. Mordechai Bobtelsky 1933 - 1946

Born in 1890 in Lithuania. Immigrated to Israel in 1925. Passed away in 1965.
He received his Ph.D. in 1923, from the University of Bern, in Switzerland. In 1925, he joined the Chemistry Department of the Hebrew University on Mount Scopus in Jerusalem. He later became a Professor and Head of the Inorganic and Analytical Chemistry Department.
His areas of research were inorganic complexes, heterometry and analytical methods.

Prof. Hugo Heiman 1946-1948

Born in 1896 in Germany. Immigrated to Israel in 1933. Passed away in 1978.
He received his academic education in Chemical Technology at the University of Bonn. Worked for a short period in E.G. Farben, in Germany. Two years after immigrating, he established the Department of Industrial Chemistry in the Technion, now the Faculty of Chemical Engineering.
Prof. Heiman was the Dean of the Department during the fifties and sixties.

Electrochemistry in the service of diabetes

Adam Heller, Dept. of Chemical Engineering, The University of Texas, Austin TX, USA 78712

The assay of blood-glucose concentration by diabetic people is performed annually 6 billion times. The number of blood glucose assays exceeds the number of all other chemical and biochemical assays combined. TheraSense Inc., now Abbott Diabetes Care, a company co-founded by the author and his son Ephraim Heller, introduced in 2000 the first microcoulometric blood glucose analyzer, requiring only 300 nL of blood. The volume of blood required for the assay was small enough to eliminate the pain associated with obtaining the much larger blood samples that were required by the earlier photonic, amperometric and chrono-amperometric blood glucose analyzers. The strip of the analyzer is a thin-layer coulometric cell. In such a cell, the thinner the blood layer, the faster the assay. The thin layer cell is the first mass-manufactured (~10^9 units/year) sub-microliter microfluidic device. The assay is accurate, because unlike in earlier assays, where the outcome depended on kinetic parameters, such as temperature, viscosity or enzyme activity, the coulometric assay does not depend on a rate.

The micro-coulometric analyzer took out the pain of the management of diabetes. I hope and expect that soon also the worry of diabetic people about developing the debilitating complications of diabetes will be eliminated through the introduction of a continuous, subcutaneously implanted, real time, amperometric glucose monitor. Its glucose/ (Ag/AgCl) cell, on two sides of a miniature plastic strip, will be self-inserted/removed by the diabetic person with little or no pain every 3 days. The monitor will predict and forewarn against hypoglycemic events that could lead to coma or death; continuously measure the glycemia and indicate the rise or decline of glycemia in the subcutaneous interstitial fluid; and predict and warn upon hyperglycemia, the unnecessary cause of diabetes complications, including blindness, kidney failure and vascular disease. The clinical trials of the continuous subcutaneous monitor were successfully completed and the results were submitted to the FDA for pre-marketing approval application. The monitor is based on the electrical "wiring" of glucose oxidase by a redox hydrogel.

The continuous monitor represents a step on the way to future, yet to be built, drug administering feedback loops. These are likely to consist of two small skin patches, replaced about weekly by the patient. One would comprise a sensor-transmitter, sensing and broadcasting, in the treatment of diabetes, the glucose concentration. The second patch would comprise an insulin reservoir, a micro-pump and a receiver/actuator, delivering, as needed, fast-acting insulin.

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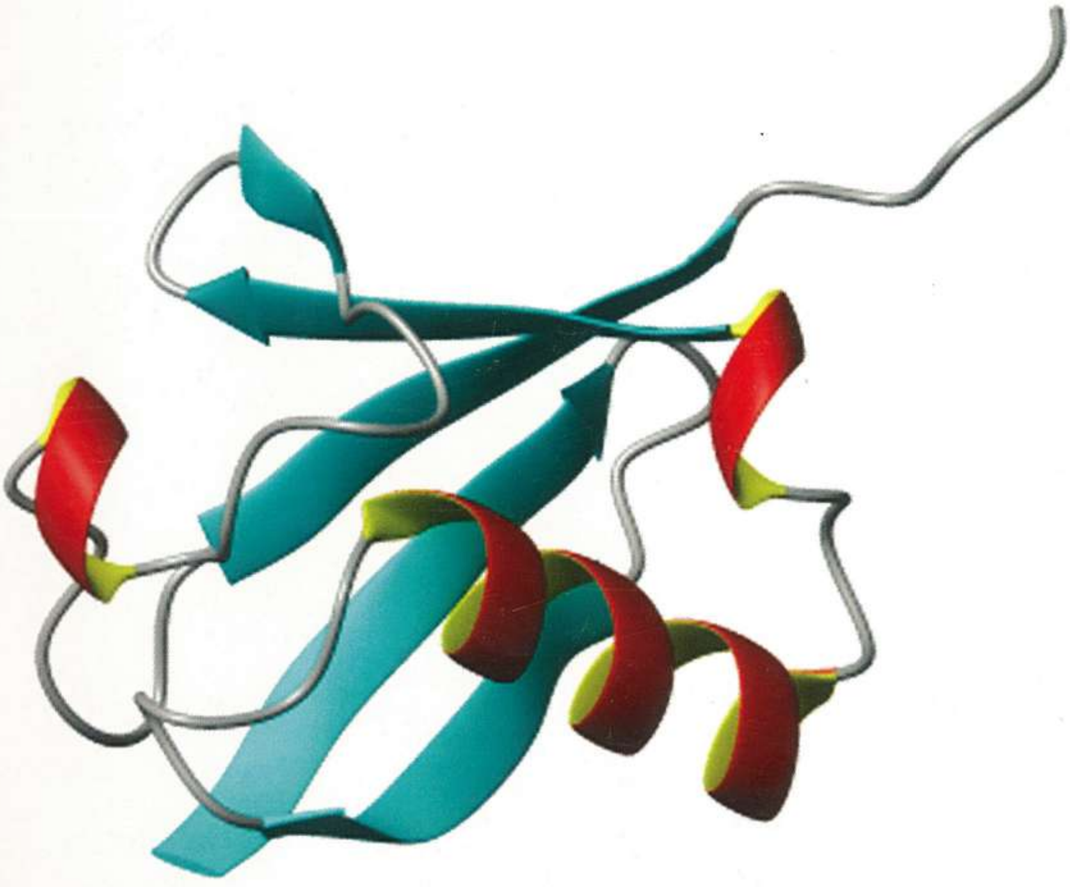

UBIQUITIN - the polypeptide that mediates protein degradation
(see Nobel Prize p.3)

כימיה בישראל
CHEMISTRY IN ISRAEL