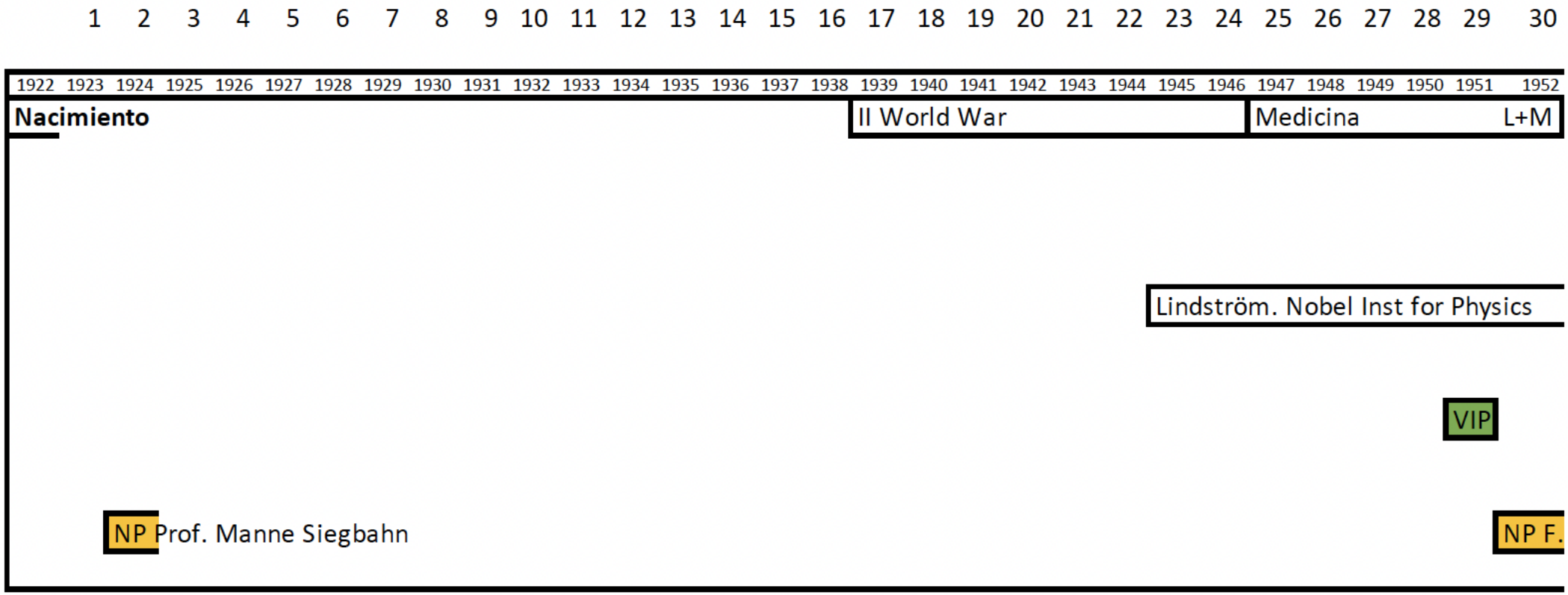
INSTITUTO UNIVERSITARIO DE XEOLOXÍA
ISIDRO PARGA PONDAL

ACTO DE HOMENAJE AL PROF. ERIK ODEBLAD EN EL CENTENARIO DE SU NACIMIENTO. 1922 – 2022.

Viernes 22 de abril de 2022

STUDIES AND APPOINTMENTS

- ***1922***. ***Born*** *in Kristinehamn, Sweden.*
- ***1952. Medicine*** *at Karolinska Institute in Stockholm. License 6,* ***1952****,* ***M.D.*** *April 21,* ***1952*** *(“Ovarian Phsphate Metabolism”)*
- ***1952 Associate professor in Medical Isotope Research*** *1952*
- ***1953 Rockfeller Foundation Fellow at the University of California****, Berkeley and Stanford.*
- ***1954-1961. Intern and Resident in Obstretics and Gynecology*** *at the Sabbatsberg Hospital, Karolinska Institute*
- ***1961-66 Research Fellow of the Swedish Medical Research Council***
- ***1966 Ph.D. in Physics at the University of Uppsala****.*
- ***1966 Professor of Medical Biophysics at the*** **new** ***University of Umeå****,.*
- ***1988. Retired and Emeritus Professor*** *since then.*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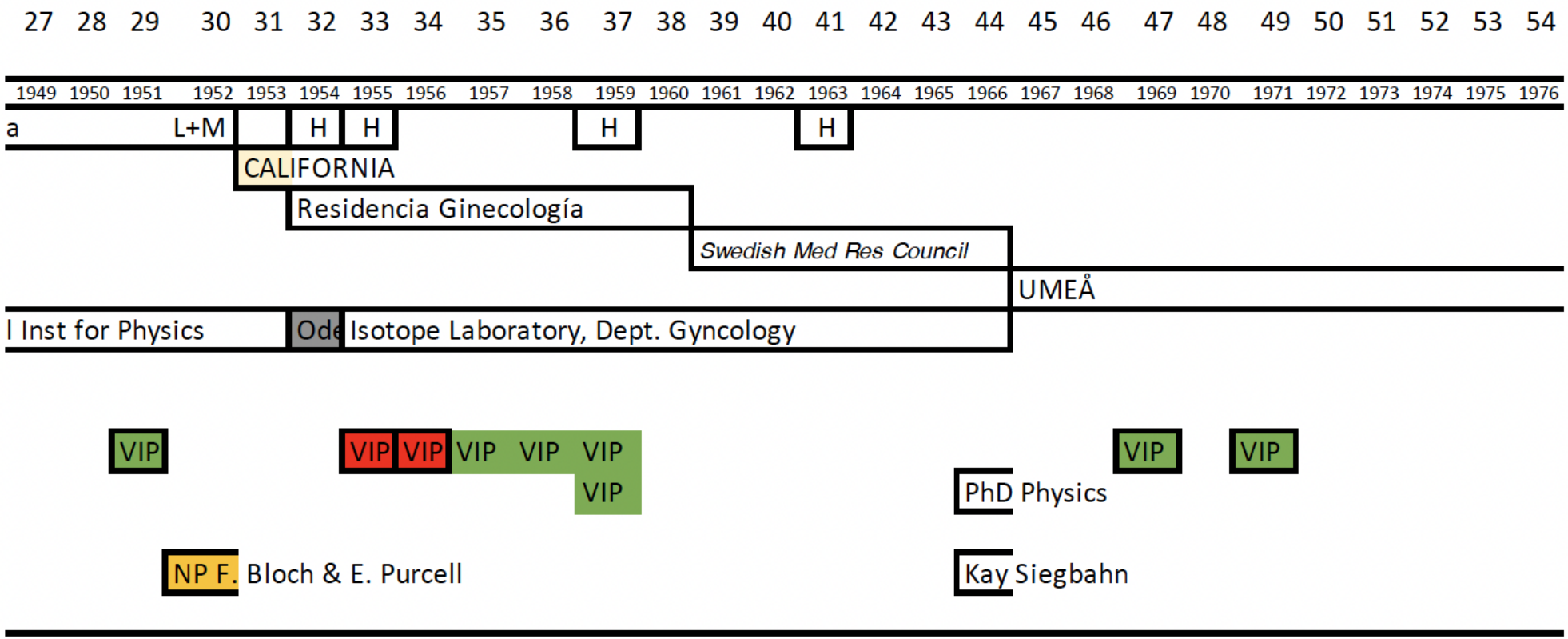
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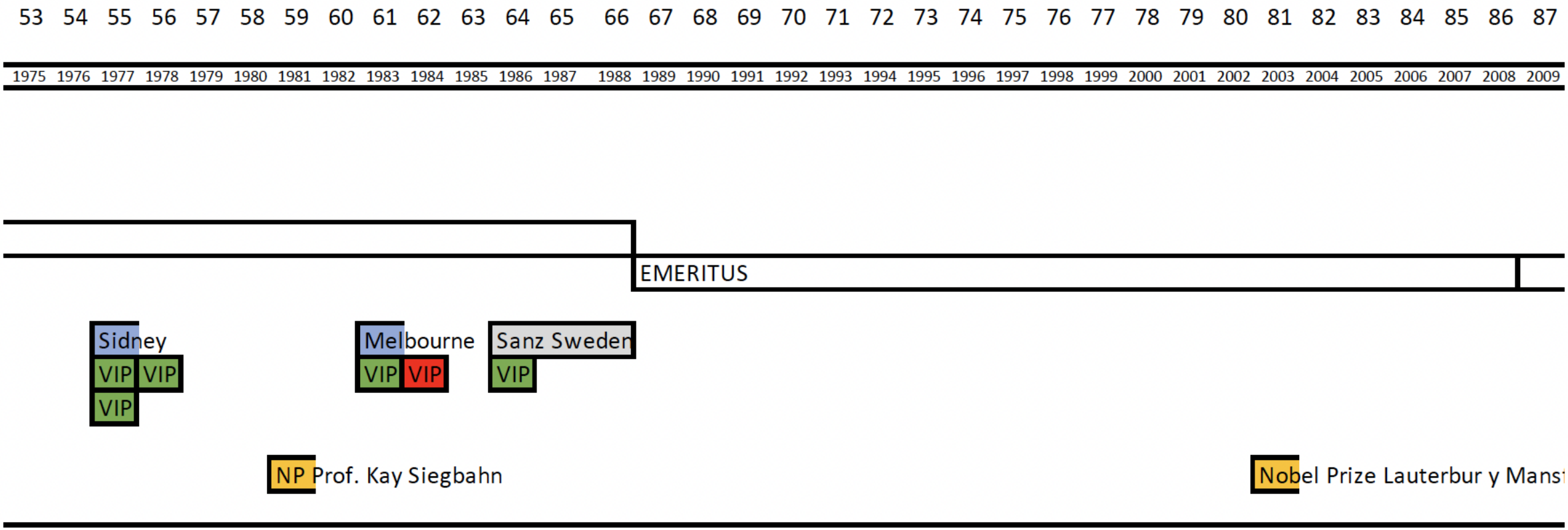
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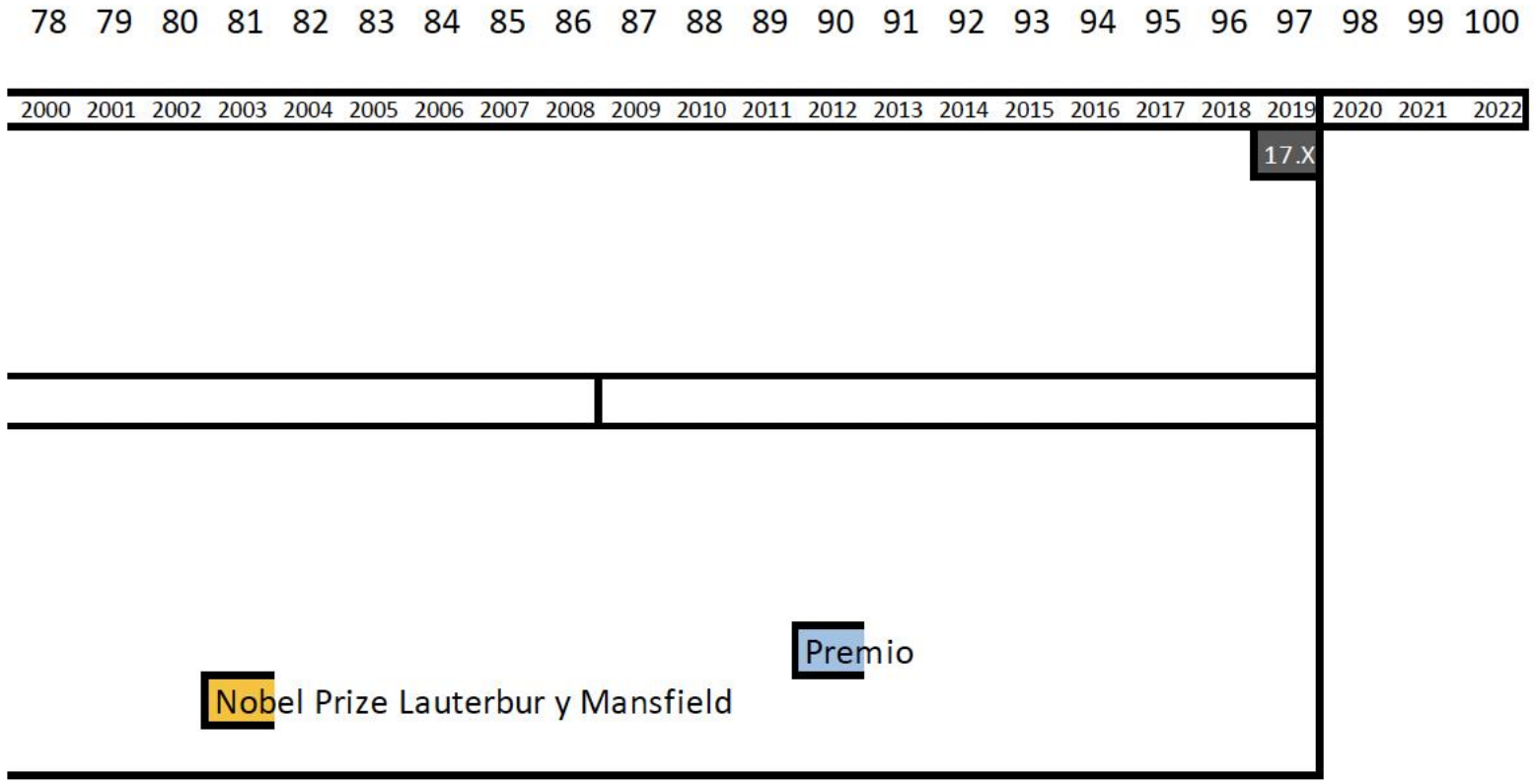
Nobel Prize Lauterbur y Mans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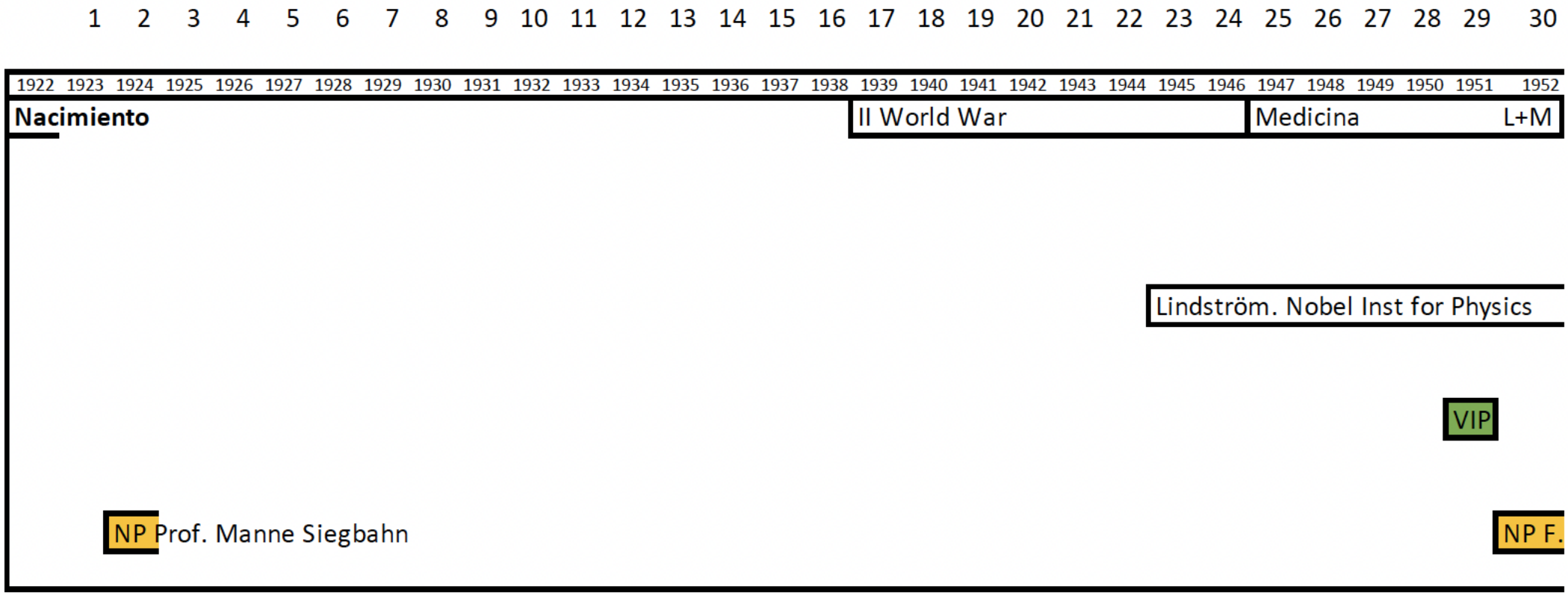
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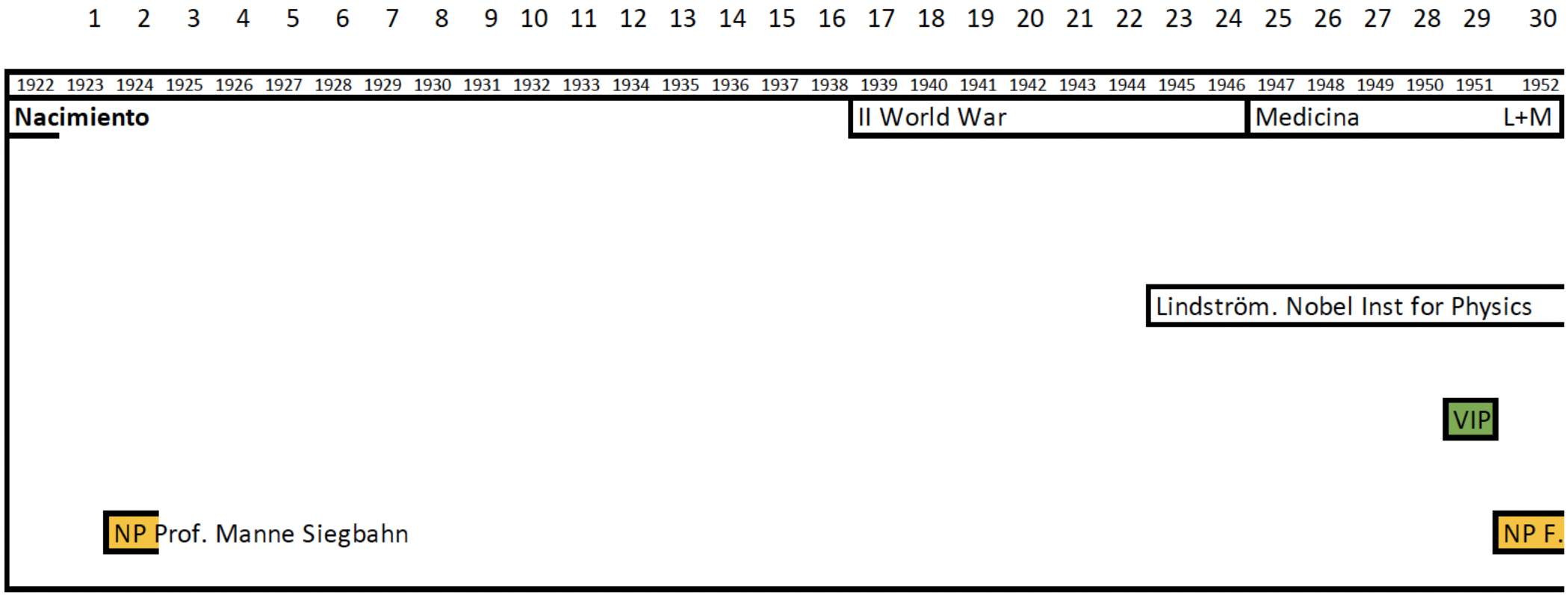
The Nobel Prize in Physics 1924

"for his discoveries and research in the field of X-ray spectroscopy."

Karl **Manne** Georg **Siegbahn**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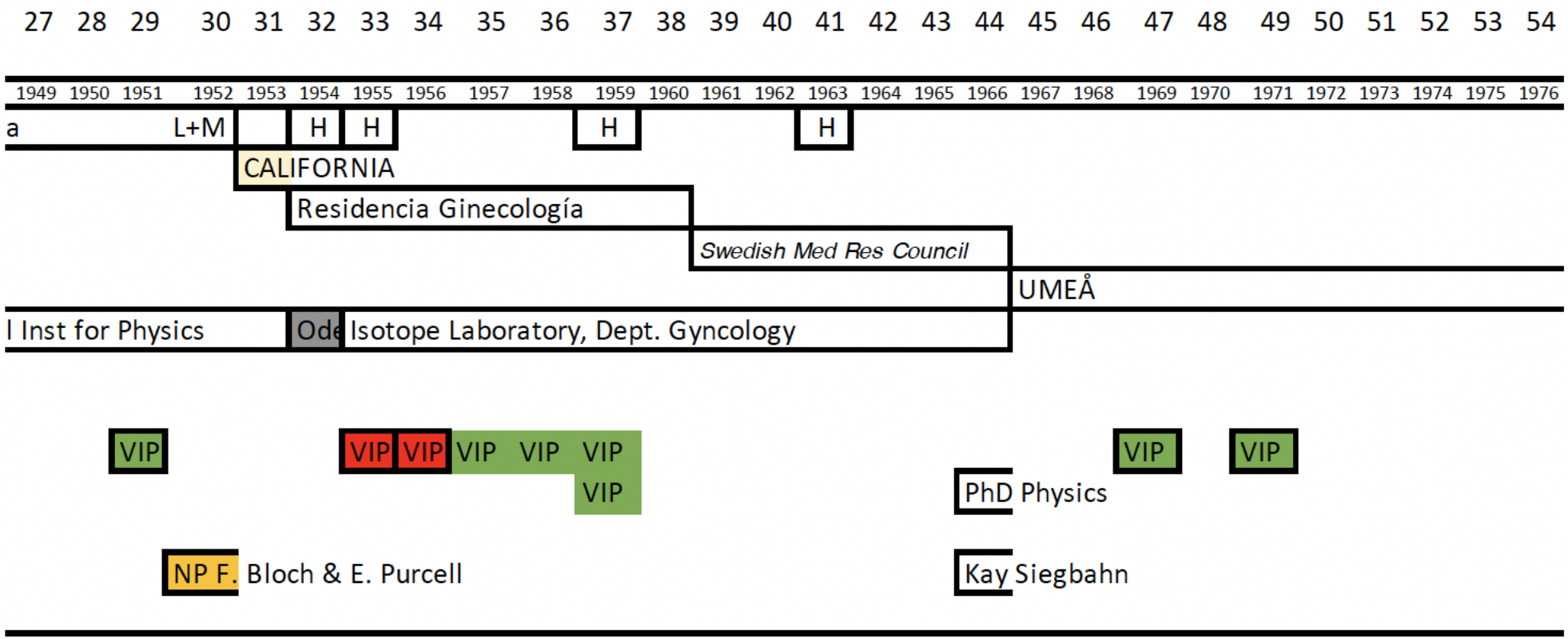
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NP F. Bloch & E. Purcell
Kay Siegbahn

California - Suecia

- *First paper on cervical mucus in 1951 and reported on a study on Mycoplasma (at that time called PPLO = Pleuropneumonia-Like Organisms) in women with and without pelvic inflammatory disease.*
- *1953 at the University of California, Berkeley and Stanford, as a Rockfeller Foundation fellow: new techniques for Nuclear Magnetic Resonance (NMR) and Activation Analysis.*
- *After returning home to Sweden I continued my clinical work in obstetrics and gynecology and removed samples of cervical mucus for research.*
- *The NMR and Activation Analysis studies were first carried out at the Nobel Institute of Physics in Stockholm*

Figure 1. ne 1950s.
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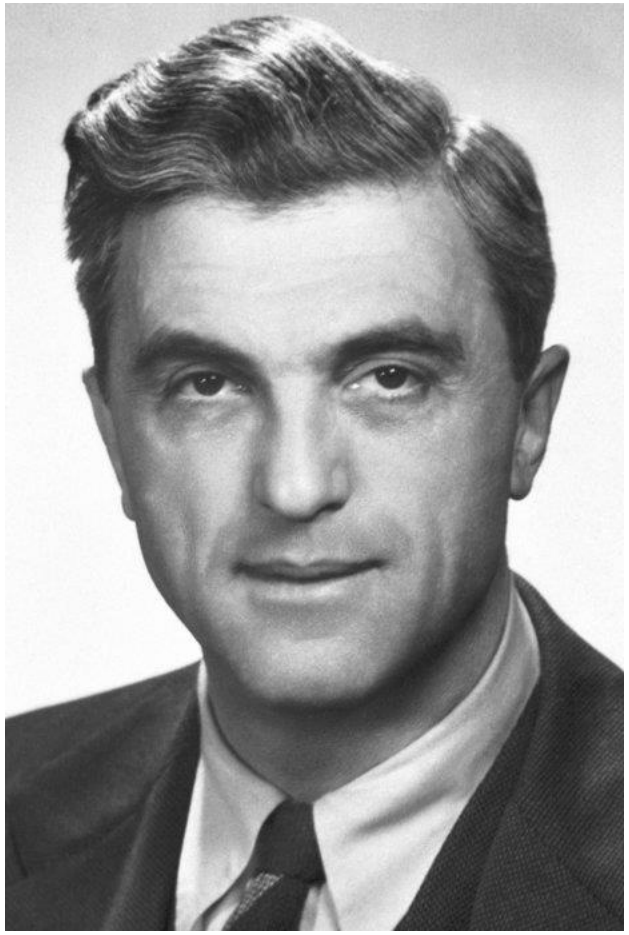
Bloch_1950

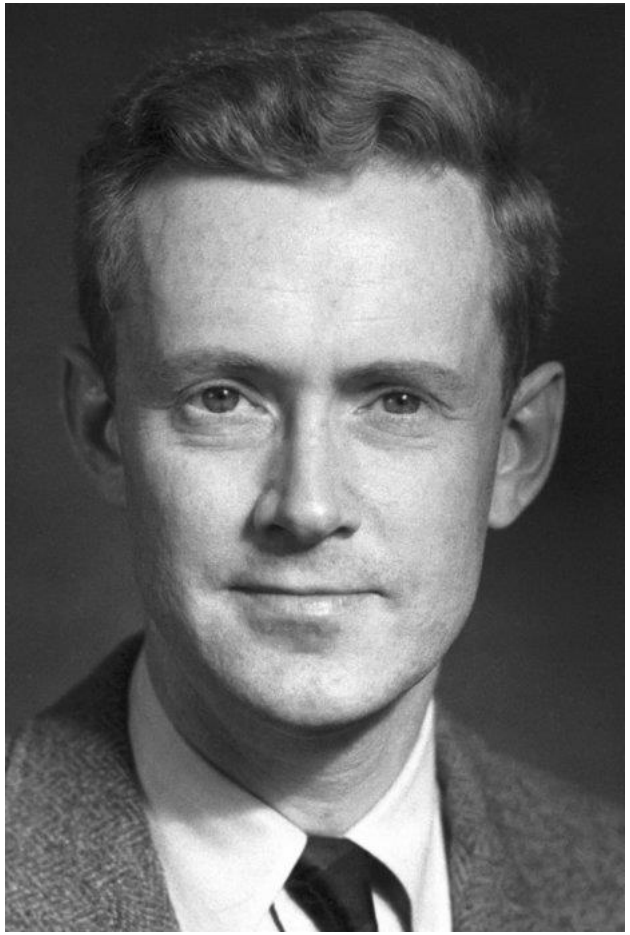
In Stanford, on the other side of San Francisco Bay, he met Felix Bloch. Odeblad asked him whether he could use his NMR spectrometer to study human samples, but Bloch's response was negative. He made it clear that NMR was a tool for physicists, not for research into physiology, medicine, or biology. Odeblad returned to Sweden and got his own machine.

California 1953
(Primogénito 1954)



The Nobel Prize in Physics 1952

"for their development of **new methods for nuclear magnetic precision measurements** and discoveries in connection therewith."



Felix Bloch (1905-83)

Stanford University

E. M. Purcell (1912-97)

Harvard University

ACRÓNIMOS

- ***NMR nuclear magnetic resonance*** *(NMR), which is the original and full name;*
- ***NMR spectroscopy,*** *which is the spectroscopic versión of NMR (without spatial resolution) and commonly used in basic science, in particular, chemistry;*
- ***NMR imaging****, which is the imaging version of NMR and used mainly by nonmedical imaging scientists;*
- ***MRI: magnetic resonance imaging (MRI),*** *which is identical to NMR imaging, mainly used in the medical community; and*
- ***µMRI or NMR microscopy****, which is the high-resolution version of MRI.*

Gunnar Lindström

Dr. Gunnar Lindström of the Nobel Institute of Physics in Stockholm had, around 1950, built his own instrument. His magnet was of such good quality that he actually was one of the first, if not the first, to report proton NMR chemical shifts -- between water and CH2/CH3 groups in mineral oil. Lindström's spectrometer was later modified by a Swedish medical doctor, Dr. Erik Odeblad, who used it for his pioneering biomedical NMR applications in the mid-1950s."

Odeblad must have gained sufficient knowledge in building the NMR machine during his collaboration with Dr. Lindström. In addition to using Gunnar Lindström's instrument, he started to build his own NMR system in the hospital he worked for as a physician (the Isotope Laboratory, Department of Gynecology, Sabbatsberg Hospital Stockholm, Sweden). In fact, throughout his time, Odeblad built 3 NMR machines, with magnetic fields of 0.4 T, 1.1 T, and 3.9 T.

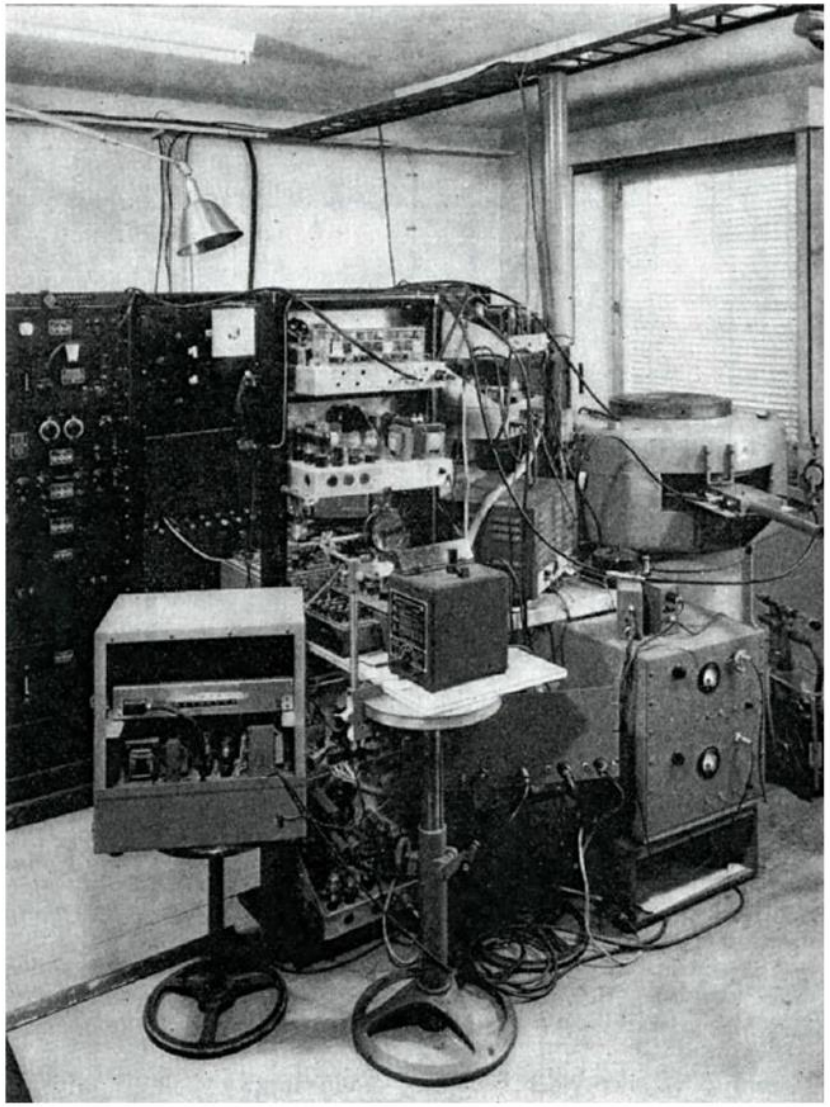


Figure 2. The nuclear magnetic resonance (NMR) instrument used in Lindström's dissertation research.
Image source: Page 16 of Lindström's 1952 PhD dissertation, which was included in "Arkiv för Fysik, Bd 4, Nr 1."

Having been refused access to the Stanford NMR machine by Bloch, Erik Odeblad returned to Sweden in 1954 without getting any NMR experiments done during his fellowship.

However, he soon must have come to know of Gunnar Lindström, with whom he started to study biological tissues using the NMR machine that Lindström had built for his dissertation work.

In December 16, 1954, Odeblad and Lindström submitted their first NMR research for publication.

In December 1954, Odeblad and Lindström submitted their first NMR results: the p

Odeblad is a very humble man. Many NMR scientists did not, and still do not, know of him, because they entered the arena of medical NMR 30 or more years after Odeblad's pivotal paper. Thus, he was never included in the conferences on MRI or MR spectroscopy. This may also be connected to the topic of his research: fertility. Finding out more about the propagation of humans is not mainstream research, not being part of the three "Big C" research themes: cancer, cardiac, circulation. Thus, his research has rarely been referenced in NMR or MRI circles.

resonance imaging once commented:

Cartilage
2016, Vol. 7(4) 293–297

DO

The First Study of Cartilage by Magnetic Resonance: A Historical Account

Yang Xia[1] and Peter Stilbs[2]

Abstract

Objective. To recap the historical journey leading to the first cartilage research article using nuclear magnetic resonance (NMR), published in 1955 by 2 Swedish researchers, Erik Odeblad and Gunnar Lindström. *Design.* Extensive Internet search utilizing both English and Swedish, including the dissertations available at the Royal Institute of Technology (Stockholm, Sweden) and the dissertations at Oakland University (Michigan, USA). *Results.* Using a primitive NMR instrument, as part of his graduate research at the Nobel Institute for Physics (Stockholm, Sweden), Odeblad [illegible] characteristics of the NMR signal in calf cartilage. The authors wrote, "In cartilage and fibrous [illegible] signals probably arise from highly viscous water with short spin-lattice relaxation time, the [illegible] larger than would correspond to the water content." The authors speculated the signal differences [illegible] water and biological tissues could be attributed to the absorption and organization of the water molecules to the proteins in the tissue, which was remarkably accurate. *Conclusions.* It is quite certain that Odeblad and Lindström published the first biomedical study using NMR in 1955. In this article, cartilage and a number of other biological tissues were examined for the first time using NMR.

Abstract
Objective. To recap the historical journey leading to the first cartilage research article using nuclear magnetic resonance (NMR), published in 1955 by 2 Swedish researchers, Erik Odeblad and Gunnar Lindström.

If a sample containing atomic nuclei with a magnetic moment is placed in a magnetic field, the nuclei take up certain allowed directions with respect to the field. Transitions between these quantized directions can be induced if electromagnetic radiation with the appropriate quantum energy acts upon the sample. In a magnetic field of about 6,700 gauss the quantum energy for proton transitions is about $9 \cdot 10^{-20}$ erg, corresponding to a frequency of about 26.5 megacycles.

If this 'resonance frequency' is applied to the specimen, and the magnetic field is swept over a small interval less than a gauss, absorption of energy can be detected by the resonance absorption technique of PURCELL,

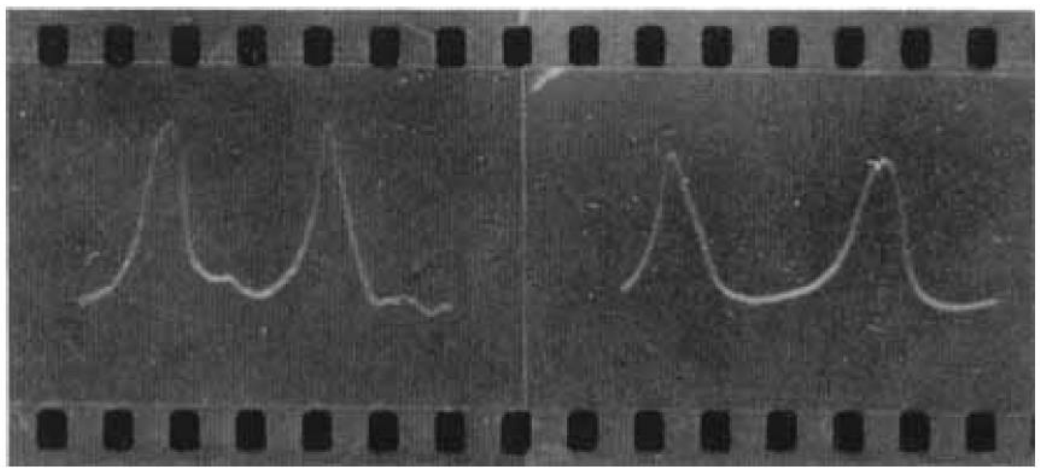


Fig. 1. Left: the proton signals from water. Right: the proton signals from living yeast cells. The same magnetic field and operating conditions were used in both cases. The magnetic field was swept sinusoidally so that two proton signals appear for each specimen, one at increasing, and one at decreasing, field. The proton signals in yeast were lower and somewhat broader than in pure water.

Results

In a first series of experiments, the signal size was measured for distilled water which had been aerated for two hours with nitrogen, air or oxygen. As shown in Table 1, there was no measurable difference

Table 1.

A	B	C	D	E	F
Dist. water under N_2	13.4	0.7	10	94	100
Dist. water under air	14.2	0.6	11	100	100
Dist. water under O_2	14.8	0.7	10	106	100

Key to columns in Tables 1, 2, 3 and 5.

A = Specimen observed. B = Relative area (or height) of resonance signal. C = Standard error in B. D = Number of observations to find value of B. E = Area of signal, that of (first) water sample in the series = 100. F = Water content from drying and weighing.

Table 2.

A	B	C	D	E	F
Dist. water	11.5	0.4	12	100	100
Physiol. saline	11.7	0.5	12	102	99
Heparin 1 %	11.4	0.4	12	99	99
Human blood serum	10.6	0.4	10	92	93
Rabbit blood serum	10.4	0.5	10	90	93
Human red blood cells	9.5	0.5	10	83	64
Living yeast cells	9.6	0.4	11	84	69
Killed yeast cells	9.0	0.5	12	78	70
Dist. water	11.2	0.5	11	97	100

Table 3.

A	B	C	D	E	F
Dist. water	36	3	8	100	100
Rabbit liver	27	4	9	75	70
Rabbit str. muscle	25	3	9	63	66
Rabbit fat tissue	51	6	11	142	34
Dist. water	34	4	8	94	100
Dist. water	40	4	6	100	100
Rat liver	31	3	5	77	72
Rat str. muscle	29	3	4	72	68
Rat fat tissue	59	5	7	147	37
Dist. water	39	4	5	98	100

As seen from these results, the signal size was about proportional to the water content except for fat tissue where it considerably exceeded the water content.

Table 4.

G	H	J	K
Dist. water	1.9	0.4	5
Rabbit liver	2.2	0.5	4
Rabbit str. muscle	1.7	0.4	4
Rabbit fat tissue	<0.8	0.2	5
Glycerine	<0.8	0.2	5
Dist. water	1.7	0.4	4
Calf cartilage	<0.8	0.2	4
Human tendo Achillis	<0.8	0.2	4
Dist. water	2.0	0.3	8
Heavy water, 60 %	3.2	0.6	7

Columns in Table 4: G = Specimen observed. H = Relaxation time in seconds. G = Estimated error in H. K = Number of measurements.

Table 5.

A	B	C	D	E	F
Dist. water	22	4	4	100	100
Cartilage	26	3	6	118	53
Fibrous tissue	22	5	5	100	42
Corpus vitreum	20	4	4	92	97
Dist. water	23	3	4	104	100

In 1966, Erik Odeblad received his PhD in physics ***under the supervision of Dr. Manne Siegbahn*** *from the University of Uppsala (Sweden), where Dr. Kai Siegbahn was the Professor and Chair (the same position that his father Dr. Manne Siegbahn had in the past).*

*Erik Odeblad's PhD dissertation can still be found in the Physics Department of the Royal Institute of Technology (KTH), Sweden. His PhD thesis, titled "****Micro-NMR in High Field Permanent Magnetic Fields—Theoretical and Experimental Investigations with an Application to the Secretions from Single Glandular Units in the Human Uterine Cervix.****" The dissertation has 188 pages, containing a large portion in NMR instrumentation (chapters 1 to 12, pp. 12-119) and a small portion in biological experiments (chapters 13 to 15, pp 120-154).*

In the preface, Odeblad acknowledged and thanked the initial contributions of Gunnar Lindström in 1954. Figure 3 shows the magnet of his NMR machine (from his PhD dissertation). Note that his new magnet looked very different from the magnet in Gunnar Lindström's instrument shown in Figure 2.

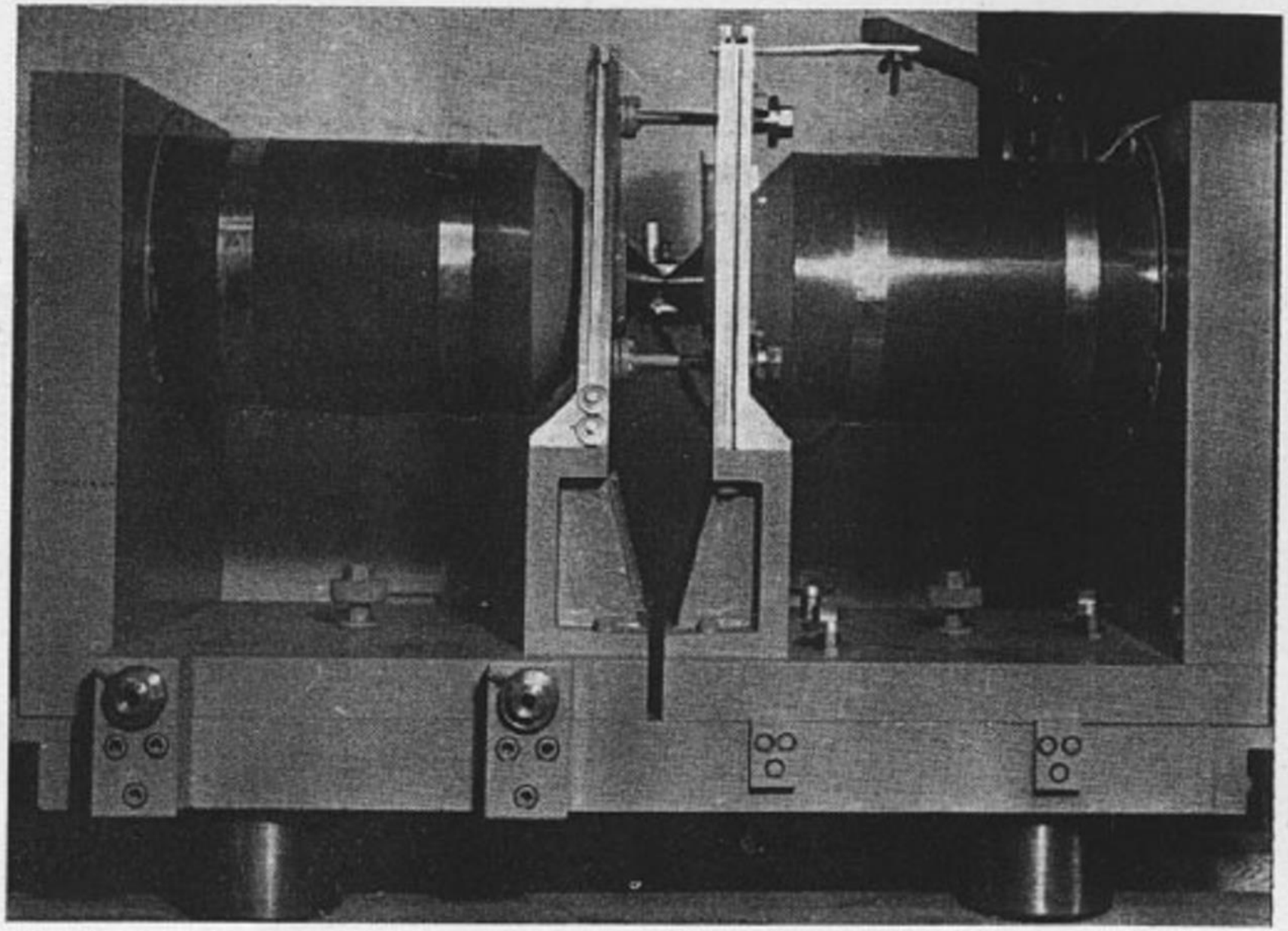
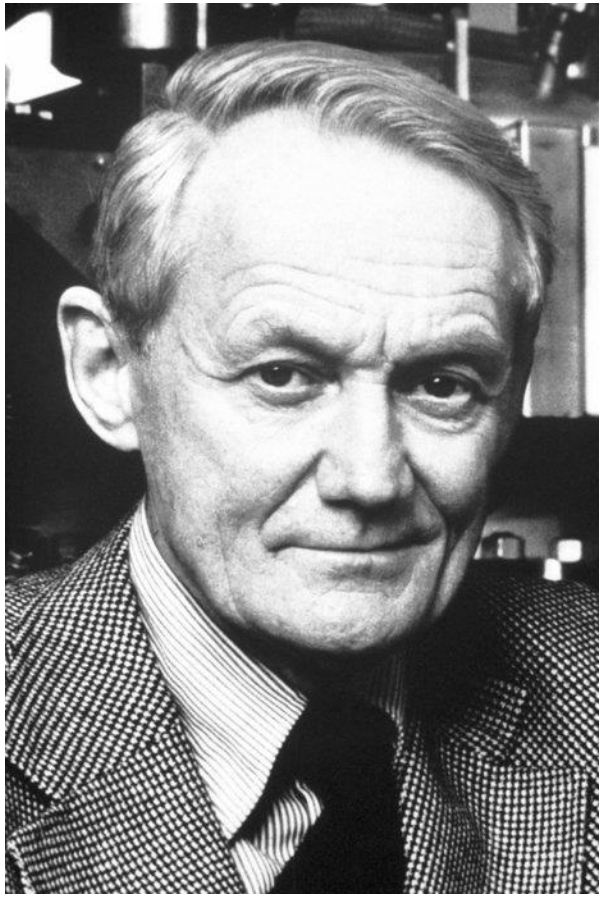


Fig. VII:D Photograph of permanent magnet assembly P8. Approximate scale, 1:10. To the left, on front, the master screws for horizontal adjustment.

Manne Siegbahn

The Nobel Prize in Physics 1924
"for his discoveries and research in the field of **X-ray spectroscopy."**



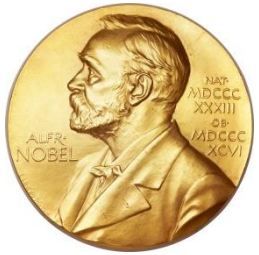
Kai M. Siegbahn

The Nobel Prize in Physics 1981 (1/2)
"for his contribution to the development of **high-resolution electron spectroscopy."**

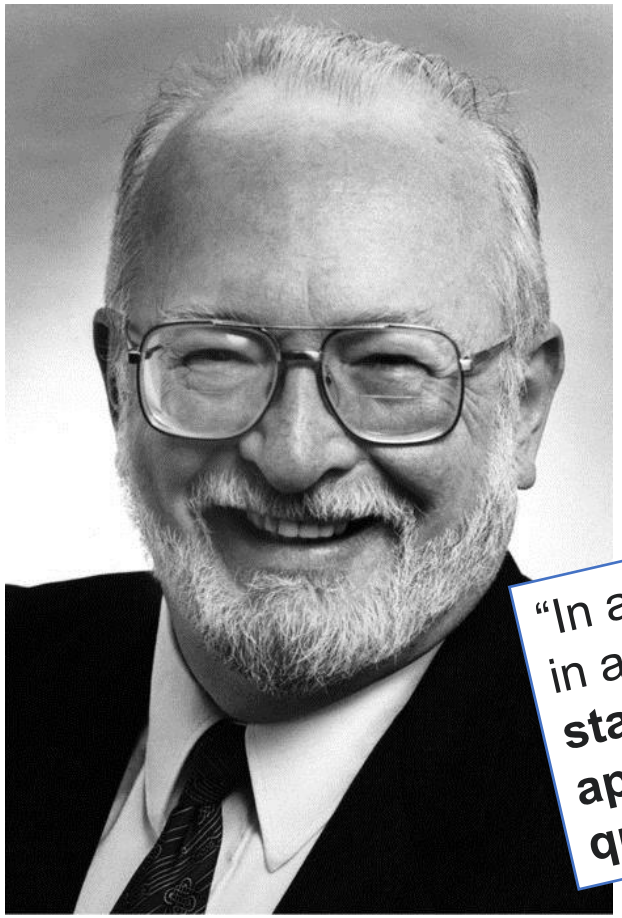
N. Bloembergen and A. Schawlow (1/2)
"for their contribution to the development of **laser spectroscopy"**

In conclusion, it is quite certain that Odeblad and Lindström published the first biomedical study involving the use of NMR. Here, cartilage and a number of other biological tissues were examined for the first time using NMR. This conclusion is further supported by the credit given by ***Paul Lauterbur in his 2003 Nobel lecture, for his invention of MRI that earned him and Peter Mansfield the Nobel Prize in Physiology or Medicine.***

The Nobel Prize in Physiology or Medicine 2003



"for their discoveries concerning Magnetic Resonance Imaging." (MRI)



Paul C. Lauterbur (1929-2007)

ALL SCIENCE IS INTERDISCIPLINARY – FROM MAGNETIC MOMENTS TO MOLECULES TO MEN Nobel Lectur
December 8, 2003 by Paul C. Lauterbur

"Nuclear magnetic rese
confluence

"In an early predecessor to MRI, Jay Singer measured blood flow in a human arm, **and actual medical measurements were started when Erich Odeblad, a Swedish M.D., constructed apparatus and devised methods to study very small quantities of human secretions for medical purposes**".

most immediately. The
old, even used their own bodies as
any predecessor to MRI, Jay Singer measured
flow in a human arm, and actual medical measurements were started when Erich Odeblad, a Swedish M.D., constructed apparatus and devised methods to study very small quantities of human secretions for medical purposes. Other biological studies followed, in other labs, using animal tissues, including hearts, and entire small animals."

Peter Mansfield (1933-2017)

Of course, more details could be further discovered in this historical journey, for example, how Erik Odeblad came to be convinced that this seemingly obscure physics phenomenon could be used for his medical research, how he came to know Gunnar Lindström and persuaded him to measure these biological samples using NMR, and what kind of working dynamics was in their first biomedical research using NMR.

The First Study of Cartilage by Magnetic Resonance: A Historical Account
Yang Xia and Peter Stilbs. Cartilage 2016, Vol. 7(4) 293–297

Figura 11. *P. Mansfield y P. Lauterbur, los inventores de la técnica de MRI, galardonados con el premio Nóbel de Fisiología y Medicina de 2003. http://neurocontrarian.wordpress.com*

There is one person who completely avoided any citation of Odeblad's papers, but was very much aware of him. Years ago, Odeblad was contacted by a lawyer in New York. They had a 50-minute conversation. Odeblad was asked to admit that he never performed NMR studies of malignant tissue. The lawyer wrote an official legal protocol. A doctor from Brooklyn wanted to be the first in medical applications of NMR; he had jumped on the bandwagon more than 15 years after Odeblad. The American came across to some observers as an unceasing self-promoter with a grandiose sense of his own importance. He tried to play down Odeblad's achievement and put him into the shade. He nearly succeeded.

Dr. Peter Rinck, PhD, is a professor of diagnostic imaging and the president of the Council of the Round Table Foundation (TRTF) and European Magnetic Resonance Forum (EMRF).

ACTS & FACTS FEATURES

Raymond Damadian, Inventor of the MRI

BY JERRY BERGMAN, PH.D. * |

THURSDAY, APRIL 30, 2015

La resonancia magnética médica ha producido una revolución en la medicina y en particular en la imaginología.

En su historia se mezclan matemáticos, físicos, químicos, ingenieros y médicos que desarrollaron conceptos sin una relación aparente ni una utilidad inmediata y que lograron articular una técnica de resultado impresionante, aunando elementos tan diversos como: transformadas de Fourier y Radon, el concepto de spin, el spin nuclear, la medición de los momentos magnéticos en el neutrón, en el protón, en la materia condensada, en los tejidos, la solución de ecuaciones integrales, la retroproyección, la difusión, los gradientes, la codificación de la señal en frecuencia espacial, el espacio-K, las transformadas dobles de Fourier y la imagen.

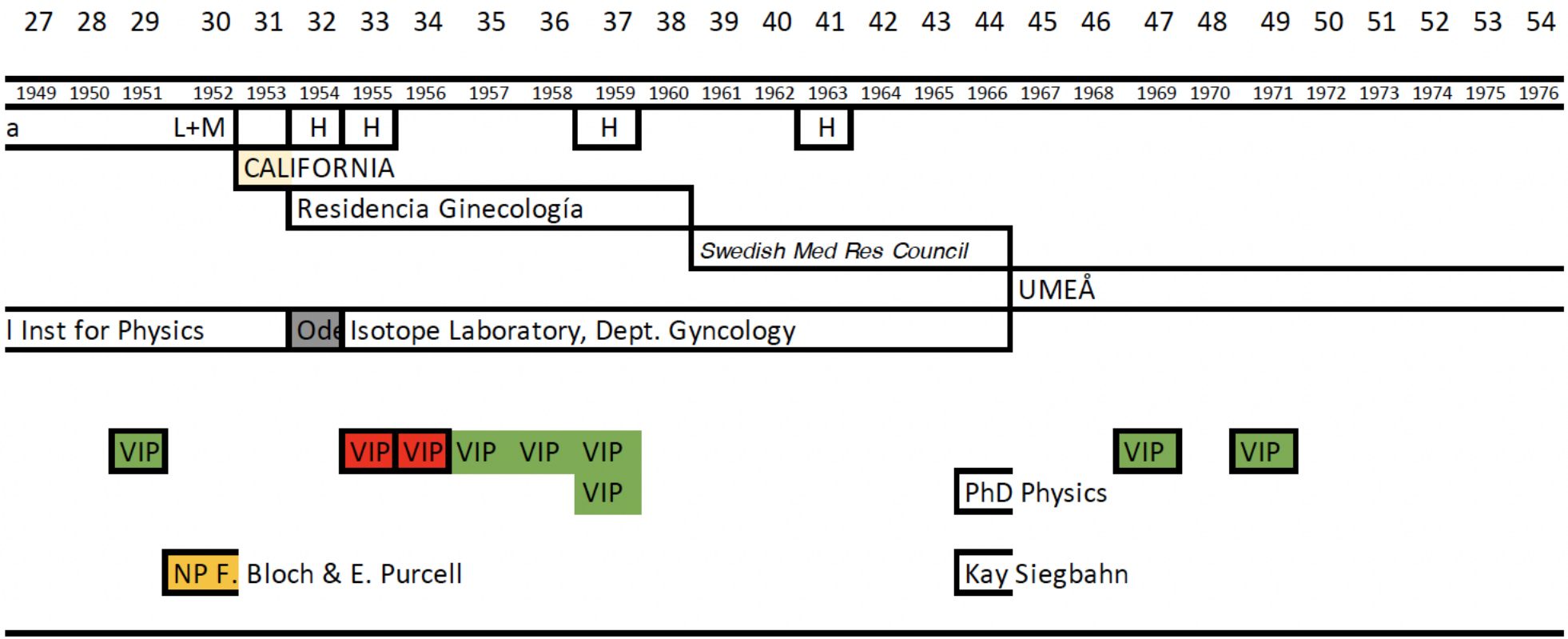
Resulta extraordinariamente interesante notar en la historia de la resonancia magnética la intrincada red de personajes que participaron y que, descubrimientos sin aparente relación en diferentes campos, y sobre todo sin una utilidad inmediata para la época, se articulan hoy produciendo una revolución en el estudio y diagnóstico de los pacientes en la medicina.

La historia de la resonancia magnética es un magnífico ejemplo de que en ciencias nadie sabe para quién trabaja.

Dr. Mauricio Canals L. Revista Chilena de Radiología. Vol. 14 Nº 1, año 2008; 39-45.
Historia de la resonancia magnética de Fouriera a Lauterbur y Mansfield : en Ciencias , nadie sabe para quién trabaja.

1957-1966 First publications on cervical Mucus

- *The first paper on NMR was published in 1957, the first one on Activation analysis was published in 1958.*
- *A unit for NMR was now built at the Department of Obstetrics and Gynecology in order to facilitate NMR studies which were most informative.*
- *In 1959 I published a study in which a molecular model for the sperm conductive mucus was presented.*
- *In a discussion to that paper I proposed for the first time that the cervical mucus contained different types of secretions coming from different crypts, a rather temerary suggestion at that time.*
- *A method was now developed to obtain and analyse mucus produced in single crypts without contamination from other crypts in the cervix.*
- *This word resulted in my Ph.D, thesis in physics, in 1966.*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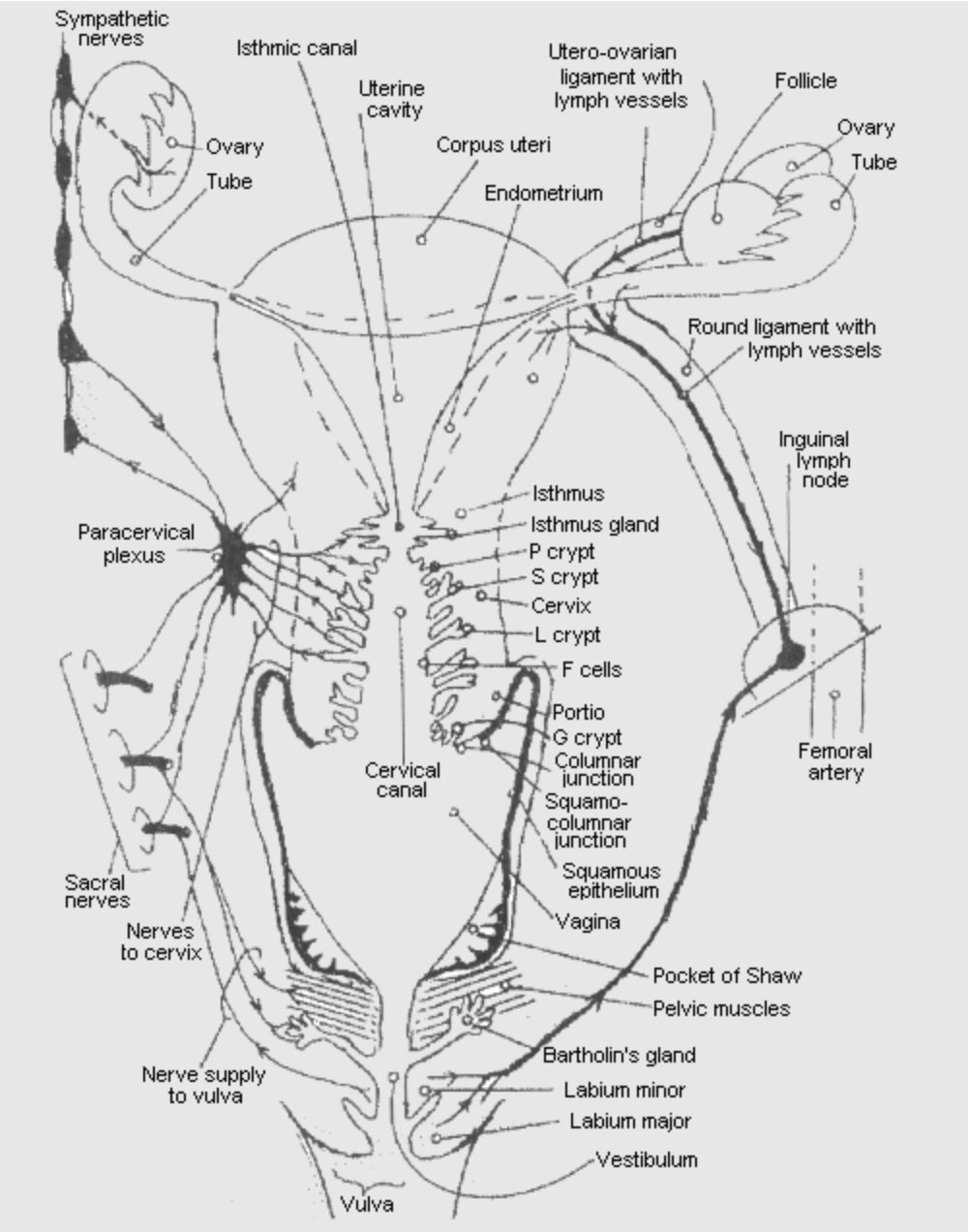
PhD Physics
NP F. Bloch & E. Purcell
Kay Siegbahn

Las primeras observaciones de relación entre el espermio y el moco cervical datan del siglo XIX,[1] aunque no fue sistemáticamente estudiado hasta 1948 cuando Erik Odeblad investigó los Micoplasmas en el Tracto genital femenino. En estos estudios Odeblad notó que el moco cervical cambiaba en el curso del ciclo femenino; posteriormente, él continuo estudiando el origen del moco cervical en el mismo cérvix.[2]

Desde 1977 el Dr. Erik Odeblad se familiarizó con el Método, y llegó a la misma conclusión que el Dr. Billings en todos sus estudios. Sus estudios continuaron por más décadas demostrando la validez científica del Método.

Cervical Mucus and their functions, Erik Odeblad, Journal of the Irish Colleges of Physicians and Surgeons, Vol. 26 No.1 January 1997.


Sympathetic nerves
Isthmic canal
Uterine cavity
Utero-ovarian ligament with lymph vessels
Follicle
Ovary
Tube
Ovary
Tube
Corpus uteri
Endometrium
Round ligament with lymph vessels
Inguinal lymph node
Isthmus
Isthmus gland
P crypt
S crypt
Cervix
L crypt
F cells
Portio
G crypt
Columnar junction
Squamo-columnar junction
Squamous epithelium
Vagina
Paracervical plexus
Cervical canal
Femoral artery
Sacral nerves
Nerves to cervix
Nerve supply to vulva
Pocket of Shaw
Pelvic muscles
Bartholin's gland
Labium minor
Labium major
Vestibulum
Vulva

Proton Magneti Gels

Show affiliations

Odeblad, Erik

RESULTS have recently n of the water phase of starch gels[1]. I
have examined the solv s with the spectrometer now in use at this
laboratory. The samples mple spinning at about 1,200 r.p.m. was
employed. The instrume at +20° C. The gels were made by
solution at 85-90° C. of gm. gelatin per ml. water) was also
examined with various c

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quired. The limit of detection is approximately 10^{-12} mole of component per ml. of carrier gas.

It is essential to purify the helium carrier gas from all substances other than neon, otherwise too high a background current occurs and the system becomes saturated. It is difficult at this stage to state the permissible impurity level. The ratio of ionization currents for 1 v.p.m. added impurity (nitrogen, oxygen, methane, argon) against the 'pure' helium is 1·05. This is better than the value obtained by Jesse and Sadauskis[2] of 1·003.

The helium purification system used is a combination of physical and chemical methods, comprising molecular sieve at 20° and −196° C., titanium at 1,000° C. and 'Hopcalite' at 400° C.

A detailed report on the application of this technique to the analysis of permanent gases is to be published.

The electronic equipment for this work was loaned by W. G. Pye, Ltd.

R. Berry

United Kingdom Atomic Energy Authority,
Development and Engineering Group,
Research and Development Branch,
Culcheth Laboratories,
Warrington, Lancs.

[1] Lovelock, J. E., *J. Chromatography*, 1, No. 1 (Jan. 1958).
[2] Jesse, W. P., and Sadauskis, J., *Phys. Rev.*, **100**, No. 6, 1755 (1955).

Proton Magnetic Resonance of the Water Phase of Gelatin Gels

Results have recently been reported concerning the proton magnetic resonance line-width of the water phase of starch gels[1]. I have examined the solvent line-width of gelatin gels at 16·7 Mc./sec. in a field of 3,910 gauss with the spectrometer now in use at this laboratory. The samples were contained in soda glass tubes of 1·2 mm. inside diameter. Sample spinning at about 1,200 r.p.m. was employed. The instrumental resolution was 0·12 p.p.m. The measurements were carried out at +20° C. The gels were made by solution at 85–90° C. of commercial gelatin in distilled water. The most concentrated gel (0·2 gm. gelatin per ml. water) was also examined with various concentrations of sodium chloride.

The line-width as a function of gelatin concentration is given in Fig. 1 (upper curve). The line-width increases rapidly up to about 6 c./s. at 0·05 gm./ml. At higher concentrations of gelatin the increase in line-width was small. On addition of sodium chloride, the line-width decreased considerably, but did not reach the value for water. As suggested in the article on starch gels[1], this upper limit of line-width of the aqueous phase may be due to the molecular mobility of macro-molecules. Approximate measurements of T'_2 by the wiggle regrowth method[2] indicated that T_2 decreased from about 1·5 sec. for distilled water (in equilibrium with air oxygen) to about 0·05 sec. for the most concentrated gel. Approximate measurements were also made on T_1 by the progressive saturation method[3]. T_1 decreased from about 2 sec. in distilled water to about 0·15 sec. in the most concentrated gel (0·2 gm./ml.).

Work on different types of biological gels is being continued, and the proton resonance of organic macro-molecules is being investigated on gels in heavy water (D_2O).

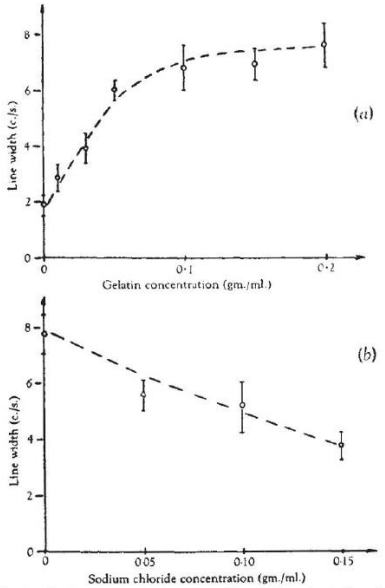


Fig. 1. Proton magnetic resonance line-widths of gelatin gels. (a) Line-width as a function of gelatin concentration in distilled water. (b) Line-width of a gelatin gel containing 0·2 gm. gelatin/ml. water as a function of concentration of sodium chloride in the gel

This work was supported by grants from the Swedish State Medical Research Council and Swedish National Association against Heart and Chest Diseases.

Erik Odeblad

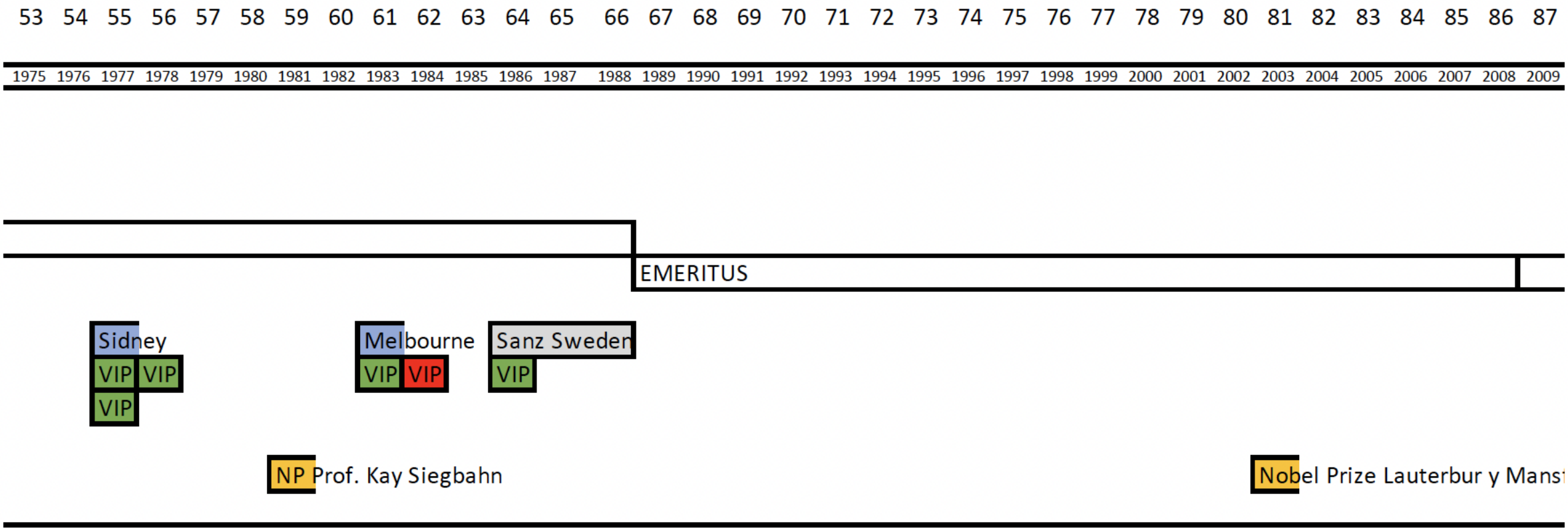
Isotope Laboratory,
Department of Obstetrics and Gynecology
of the Karolinska Institutet,
Sabbatsberg Hospital, Stockholm Va.

[1] Collison, R., and McDonald, M. P., *Nature*, **186**, 548 (1960).
[2] Gabillard, R., *C.R. Acad. Sci., Paris*, **232**, 1551 (1951).
[3] Bloembergen, N., Purcell, E. M., and Pound, R. V., *Phys. Rev.*, **73**, 679 (1948).

BIOCHEMISTRY

Analysis of Human Leucocyte Deoxyribonucleohistone by Immunoelectrophoresis on Cellulose Acetate

The internal composition of the nucleus is still unrevealed to a large extent despite many recent advances. The work described here constitutes a new approach to the problem made possible by a combination of histochemistry and immunoelectrophoresis on cellulose acetate membranes. Kohn[1] first introduced cellulose acetate as a supporting membrane for zone electrophoresis, and Consden and Kohn[2] showed that this material was elegantly suited to the entire process of immunoelectrophoresis. In this laboratory the techniques were found to be easily reproducible[3] and are now being used to study the human leukæmic leucocyte, with particular reference to the nucleus.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NP Prof. Kay Siegbahn
Nobel Prize Lauterbur y Mans

The discovery of G, L and S mucus was presented for the first time at the University of Surrey, England, in 1976, and later at Rottach-Egern, Stockholm, New Delhi, Seattle, and in Sydney, Australia, in 1977.

Most of the audiences did not understand how to apply this new knowledge. Dr Max Elstein of England readily accepted the G - L - S model but Dr Kevin Hume of Sydney, Australia, appreciated the significance of the discovery. Dr Hume was a member of the Billings group and he drew my attention to the fact that G mucus would be present in the infertile phase of the woman's menstrual cycle, and L and S types during the fertile phase, and also that S mucus would correspond with the Peak day.

This was the beginning of my participation, collaboration and commitment to the Billings Ovulation Method. Following Dr Hume's recommendations, I showed for cycles of different lengths, and in women of different ages, that the agreement was statistically significant. This finding was presented at a number of conferences in several countries, towns and universities, for example in Acapulco in 1982 (published in 1983), in Melbourne in 1983 and in Paris in 1986 (Odeblad 1987).

> Contrib Gynecol Obstet. 1978;4:132-42.

Cervical factors

E Odeblad

PMID: 679687

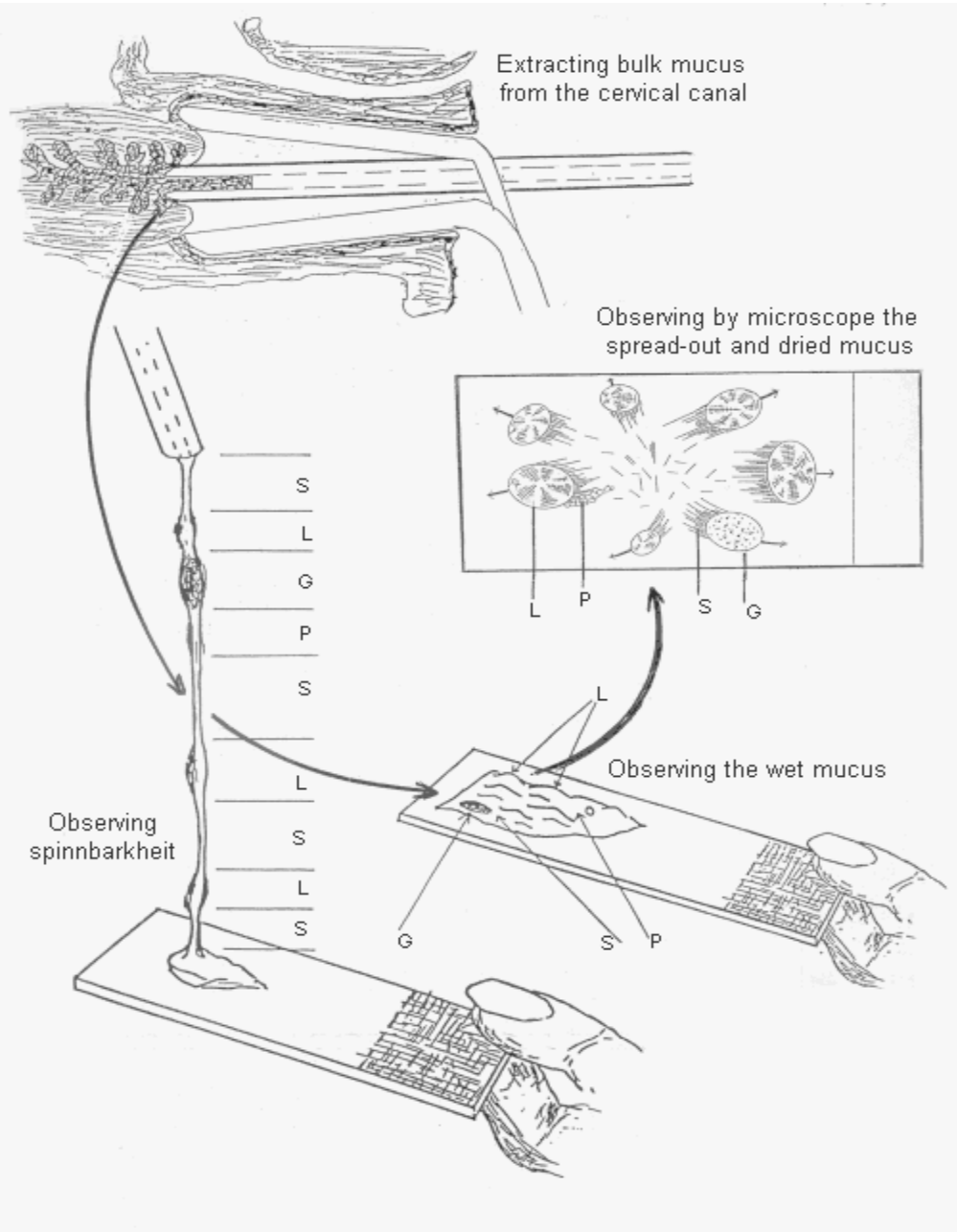
Abstract

PIP: The cervical canal mucus is important to human fertility since conception can only occur if sperm pass through the contents of the cervical canal to reach the ovum. The biophysical properties of the cervical mucus and their relation to sperm migration are, therefore, curcial. A variety of laboratory experimentation methods have been used in studies of cervical mucus: 1) sperm migration measurements; 2) reheological studies; 3) cell countings; 4) crystallization studies; 5) NMR: 6) EPR; and 7) photoelectron spectroscopy. Cervical mucus is the end result of complicated biosynthetic processes occurring in the epithelial cells of the cervical mucosa; this biosynthesis is regulated by many factors. Type E, characteristic for estrogenic stimuli on mucus biosynthesis, and type G, for gestagenic stimulation, are the 2 main types of cervical secretions. The 2 types always occur together, in differing proportions. For example, at normal ovulation there is a 97:3 ratio of type E to type G; at normal corpus luteum, the ratio is 10:90. The string variety of type E seems to aid in conveying sperm from the vagina while the loaf variety is inactive. The very low viscosity of the string variety intermicellar fluid permits very rapid sperm swimming. Not much is known regarding cervical mucus pathology or therapy.

In 1977 at an International Conference on Natural Family Planning in Cali, Colombia, the research of Professor Erik Odeblad of the University of Umeå, Sweden was mentioned. A publication by the World Health Organisation containing information supplied by Professor Odeblad was distributed; it contained detail regarding his earliest attempts to begin to classify the different types of mucus that he was recognising by modern physical techniques and also under the microscope.

Not long afterwards Dr Kevin Hume learned that Professor Odeblad was to make a visit to Sydney, Australia, in response to an invitation coming from a group of veterinary scientists. Dr Hume was able to attend Professor Odeblad's presentation and afterwards informed him of the development of the Ovulation Method, providing him with copies of the Ovulation Method teaching materials which he took away for further study.

About two years later he reported that he had gone back over the records of his own research into the activity of the cervix of the uterus during the menstrual cycle, in his capacity as Professor of Medical Bio-Physics in the University of Umeå. He said that he had been surprised and delighted to find that the work that had been carried out in Melbourne precisely coincided with his own studies in Umeå and that the guidelines that had been devised in Melbourne for the use of the Ovulation Method were certainly correct. Professor James Brown has added that the Ovulation Method has a rule to provide for every situation the woman may encounter during the reproductive era of her life.


Extracting bulk mucus
from the cervical canal
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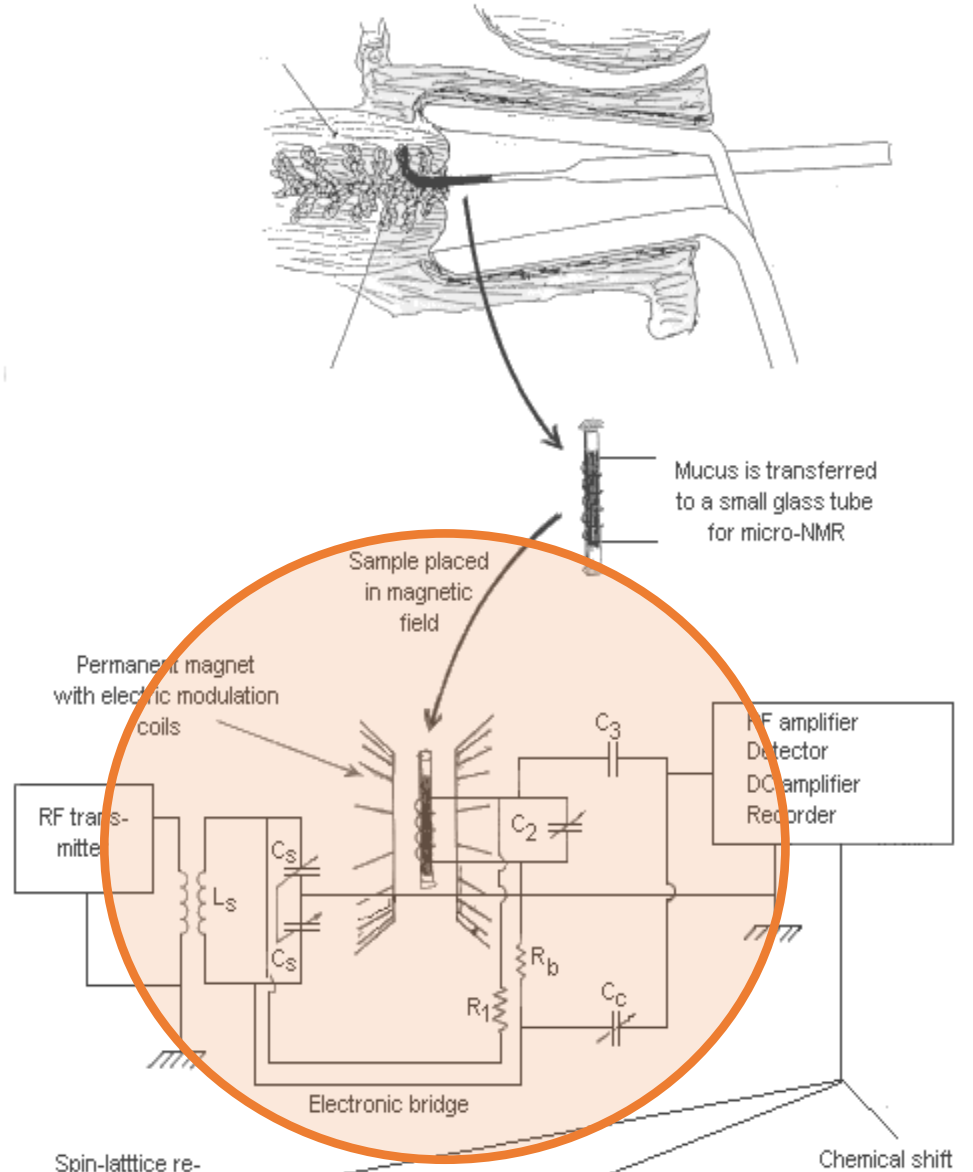


Spin-latttice re-
laxation time T

Viscosity of
mucus water

Figure 5

Precision measurement
of chemical shift of water

Type of binding of
mucus water

Figure 8

Chemical shift
of mucin protons

Chemical comp-
osition of mucus

Figure 11

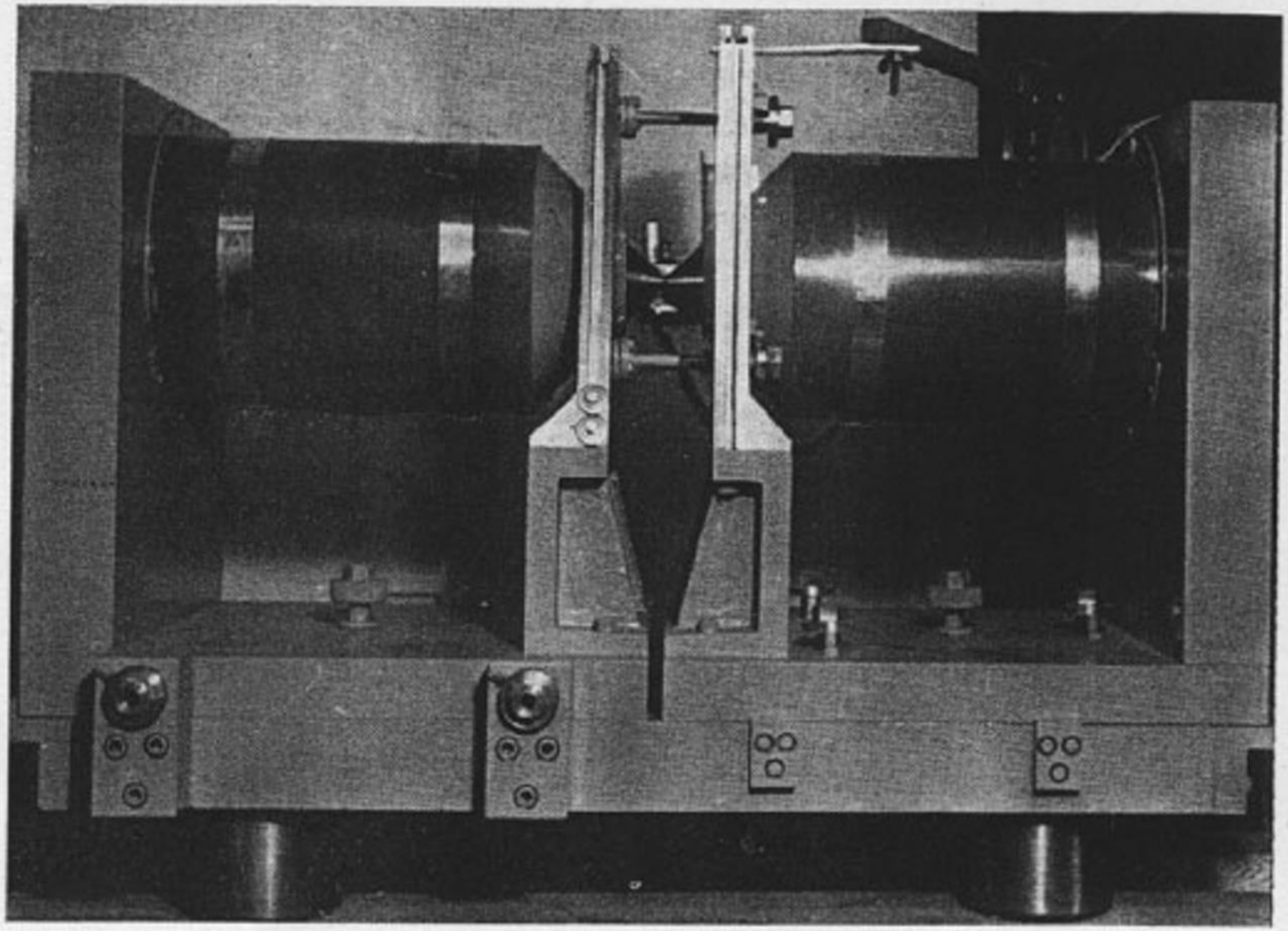


Fig. VII:D Photograph of permanent magnet assembly P8. Approximate scale, 1:10. To the left, on front, the master screws for horizontal adjustment.

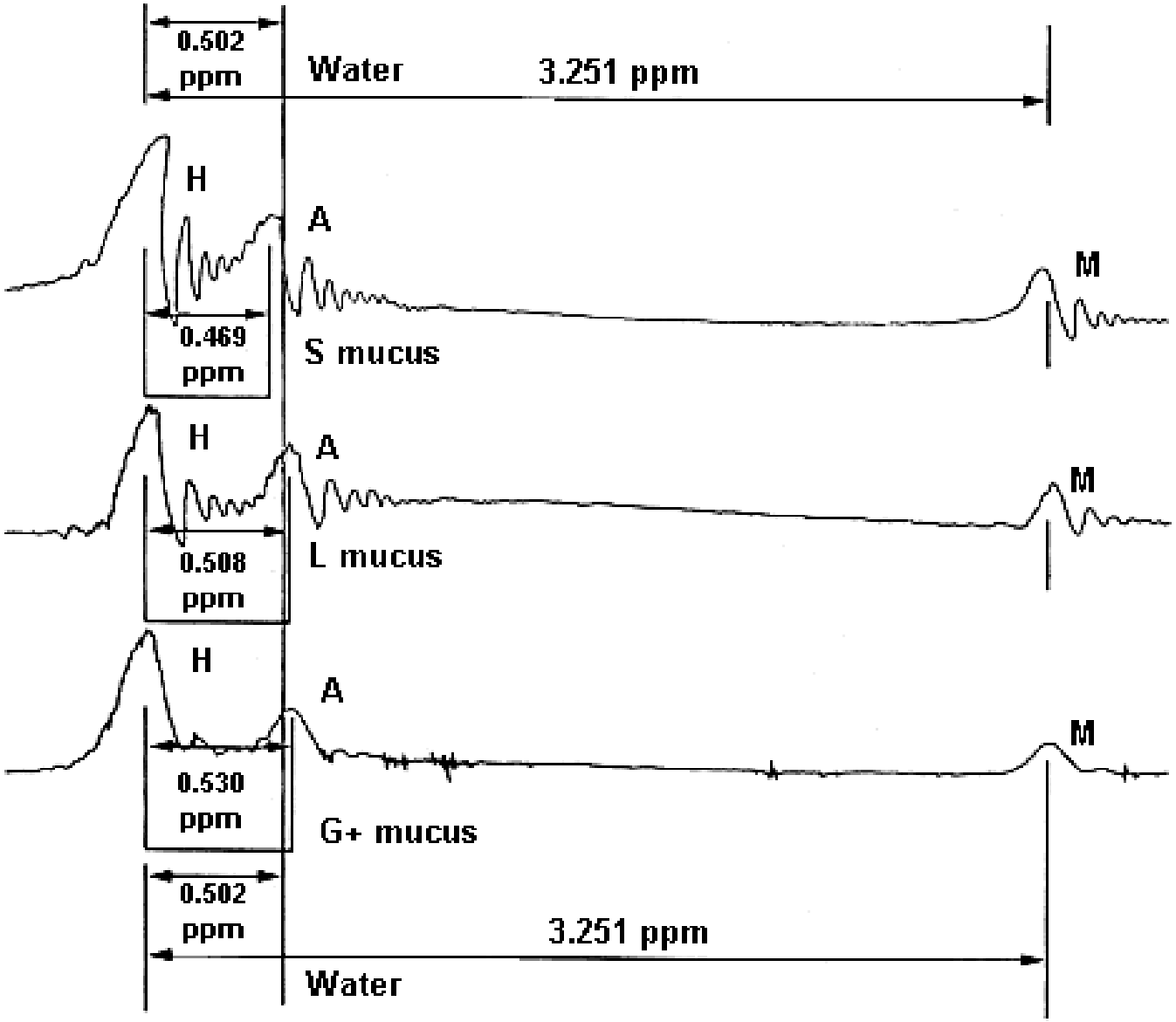
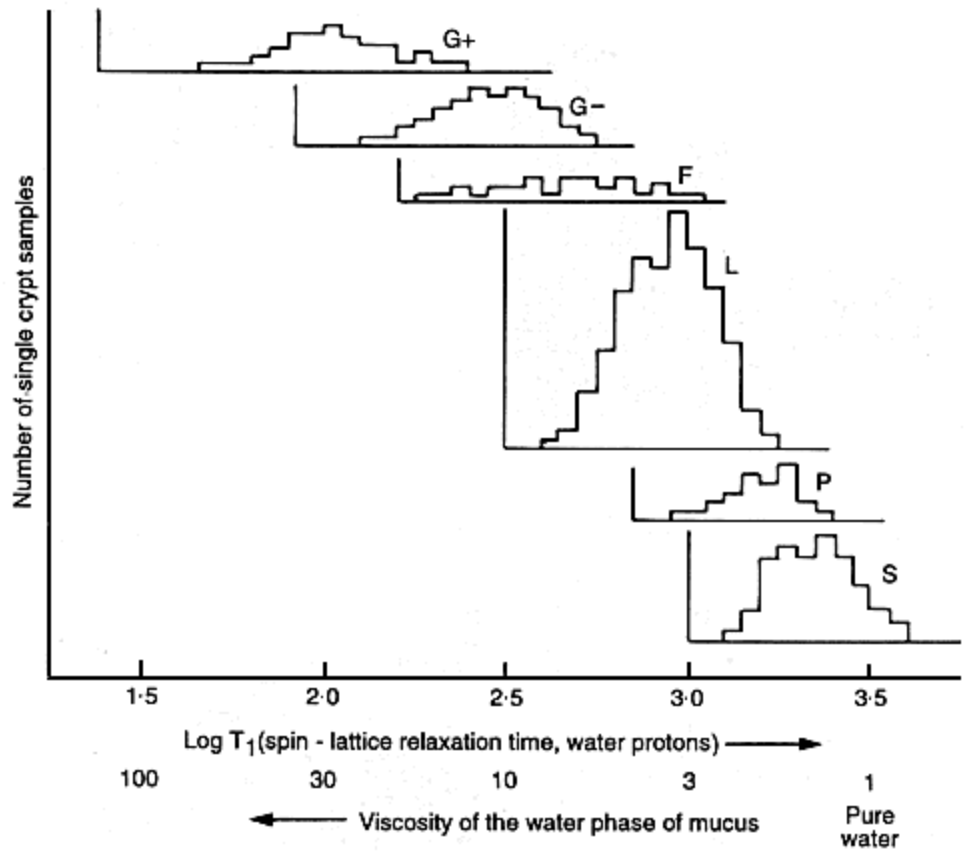


Figure 8. Enlarged NMR spectra of S, L and G+ mucus compared with that of water. This investigation demonstrated hydrogen-bonding in the aqueous phases (A) of S, L, and G+ mucus. Waves H and M are reference signals which enable the position of the aqueous signals to be obtained with very high precision. The wave shifts indicate that the water of S mucus has a small resistance to sperm cells but that of G+ mucus presents a much greater resistance.


G+
G−
F
L
P
S
Number of single crypt samples
1·5
2·0
2·5
3·0
3·5
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100
30
10
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1
Viscosity of the water phase of mucus
Pure water

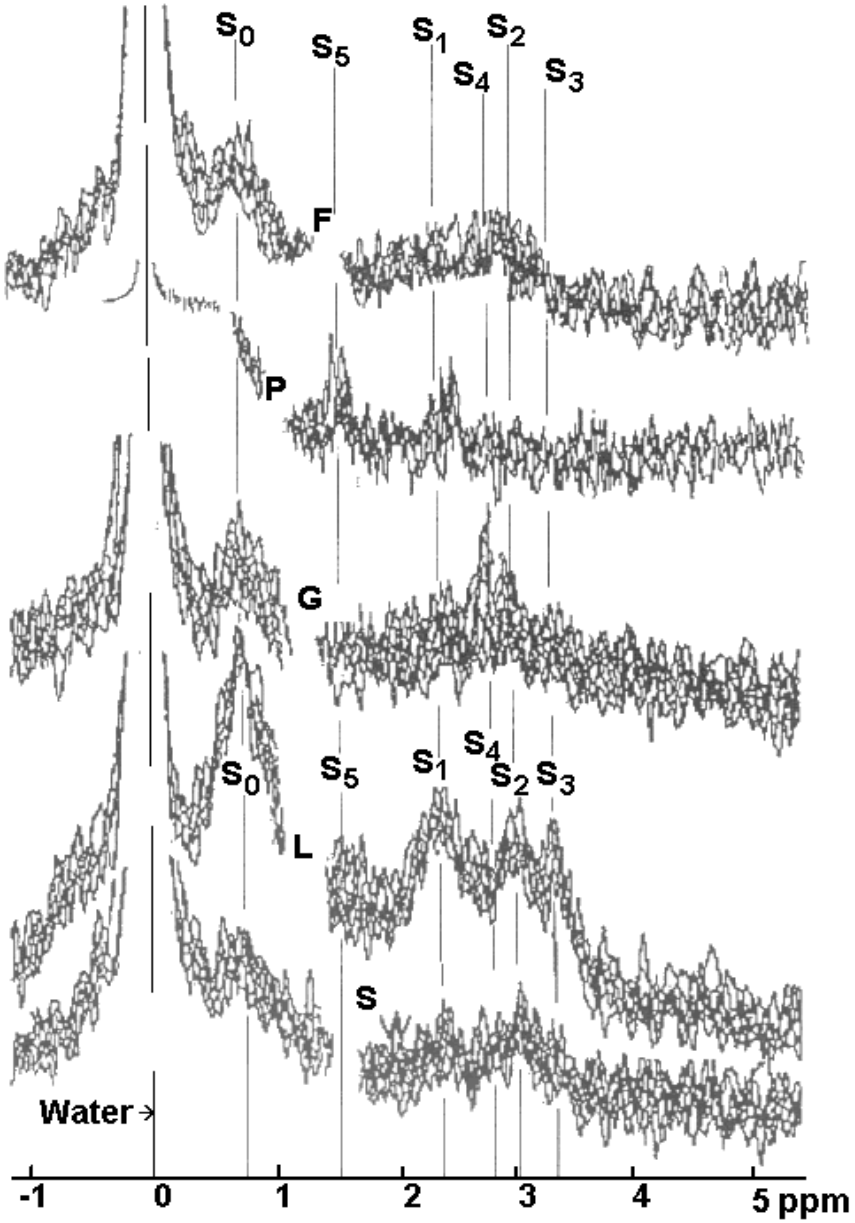
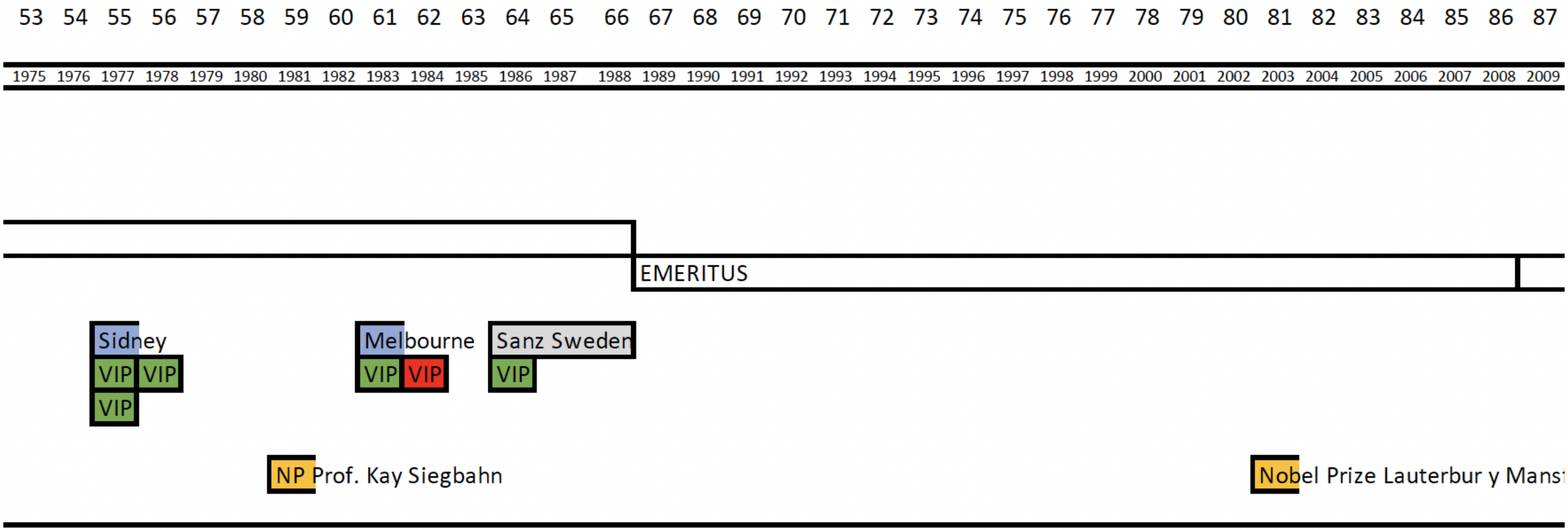


Figure 11. Proton NMR spectra of five types of cervical mucus - F, P, G+, L and S. All spectra are different, indicating that the compositions of the five mucus types are all different.

In 1983 1 had the privilege of working with Drs John and Evelyn Billings in Melbourne and also with Professor James Brown and other research workers of the Ovulation Method.

The hormonal response of G, L, and S mucus was studied. We found that L mucus was stimulated by medium and increasing levels, and S mucus by high levels, of oestrogen. Later I showed that S mucus was also stimulated by noradrenaline. G mucus was stimulated by progesterone. In the first infertile phase of the cycle the progesterone level is low, but sufficient to stimulate G crypts feebly (G-mucus). After ovulation, progesterone levels are high and stimulate G crypts strongly. This G mucus is very dense (G+ mucus).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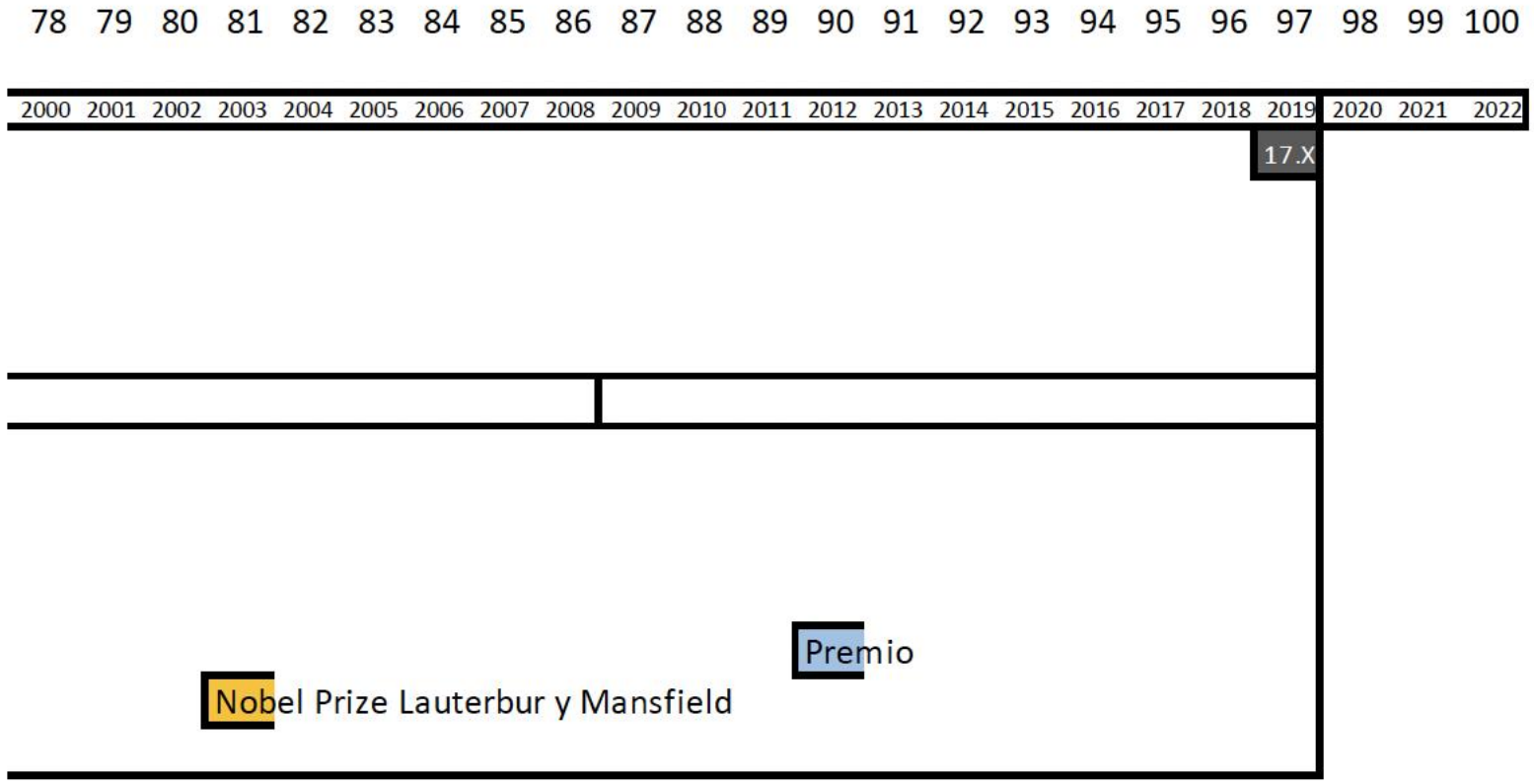
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AuntMinnieEurope.com provides the first comprehensive community internet site for European radiologists and related professionals in the medical imaging industry.

Dr. Erik Odeblad, PhD, expresses his joy after he received the 2012 European Magnetic Resonance Award.

Europe celebrates the forgotten pioneer of MRI: Dr. Erik Odeblad

By Dr. Peter Rinck, PhD, AuntMinnieEurope.com columnist

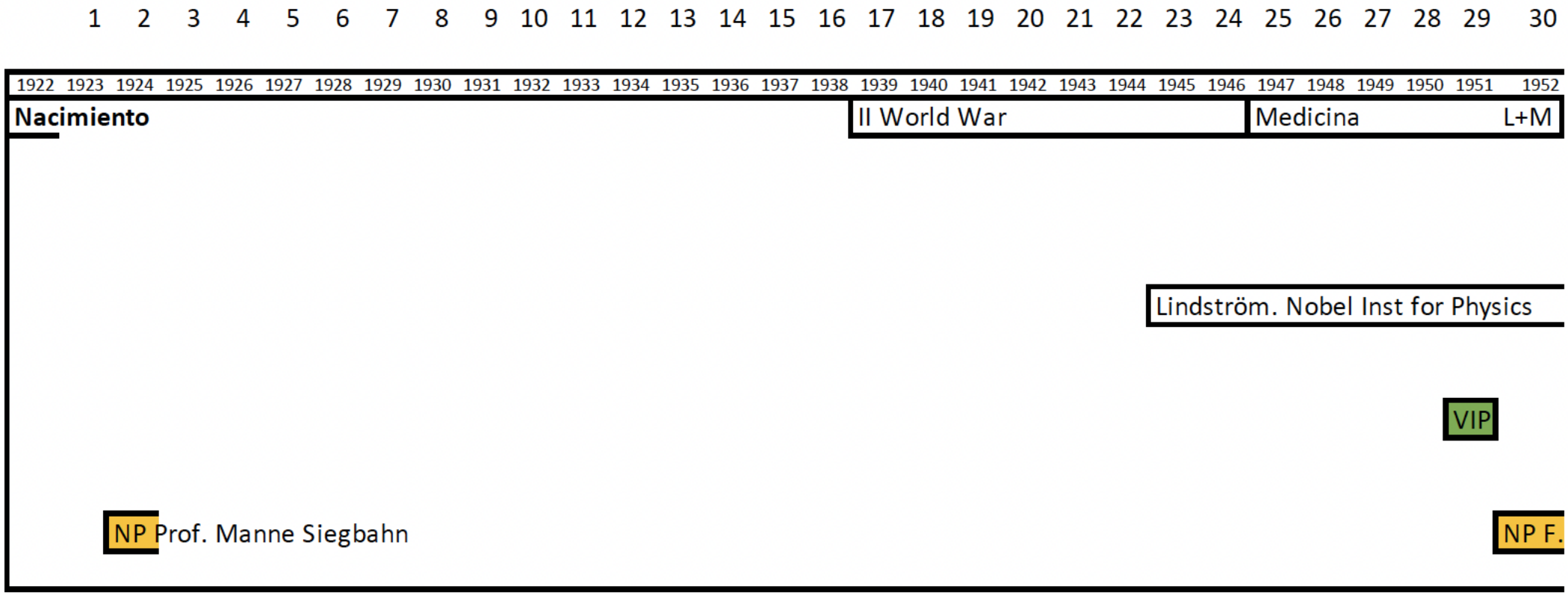
June 19, 2012 -- Four months ago, Dr. Erik Odeblad, PhD, celebrated his 90th birthday. He still works, although mostly in his study at home. This year is very important for him, he says, in several respects: It is 60 years since the Nobel Prize was awarded to Felix Bloch and Edward M. Purcell, the two pioneers of nuclear MR (NMR) in physics. Also, he and his wife Anne-Marie have been married for 60 years. They have four children, 10 grandchildren, and -- *so far*, he says -- two great-grandchildren.

On 25 May 2012, Dr. Erik Odeblad received the European Magnetic Resonance Award 2012 in a special ceremony in Umeå, Sweden. The two prizes -- one in Basic Science, the other in Medical Sciences -- were combined into a single one. Odeblad was not the only one with a happy face in the room; members of the Swedish scientific community attending the presentation were clearly gratified that their colleague was finally being recognized. So was his family. Better late than never.

Dr. Peter Rinck, PhD, is a professor of diagnostic imaging and the president of the Council of the Round Table Foundation (TRTF) and European Magnetic Resonance Forum (EMRF).

2012 European Magentic Resonance Award

Una larga (y fructífera) vida…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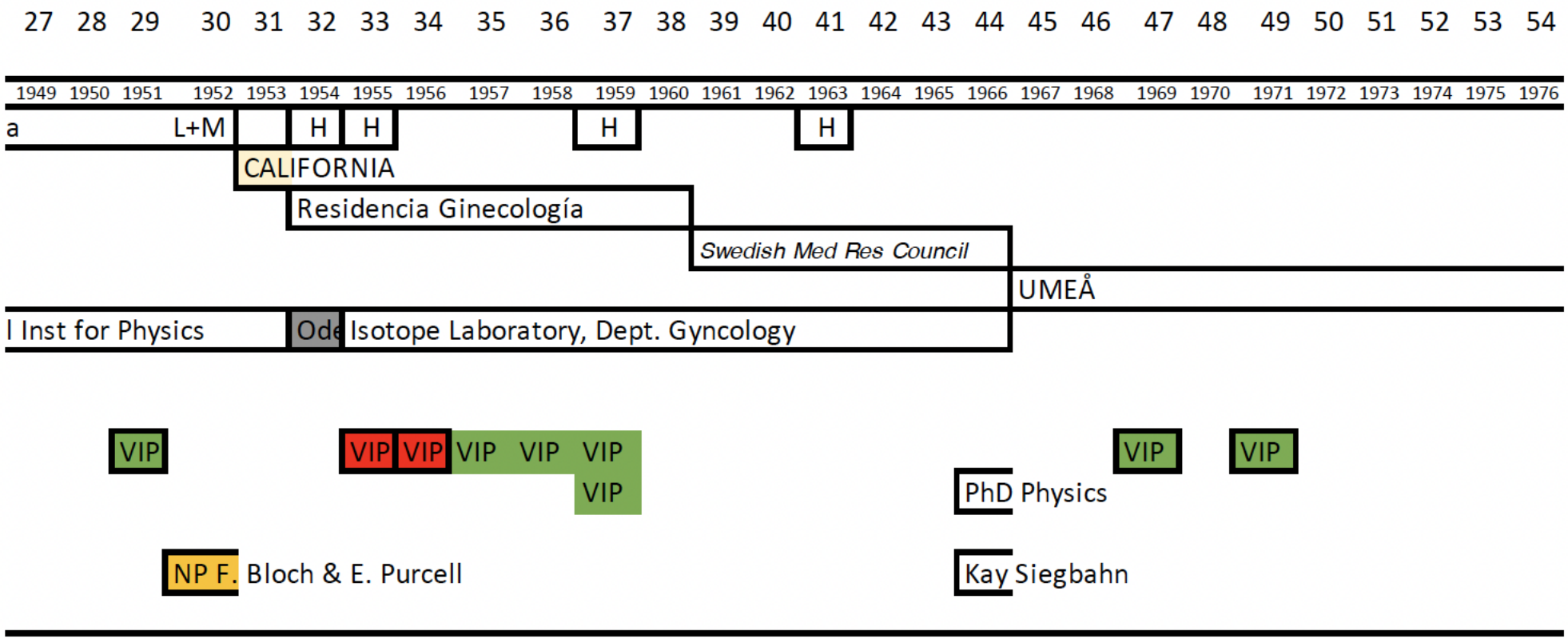
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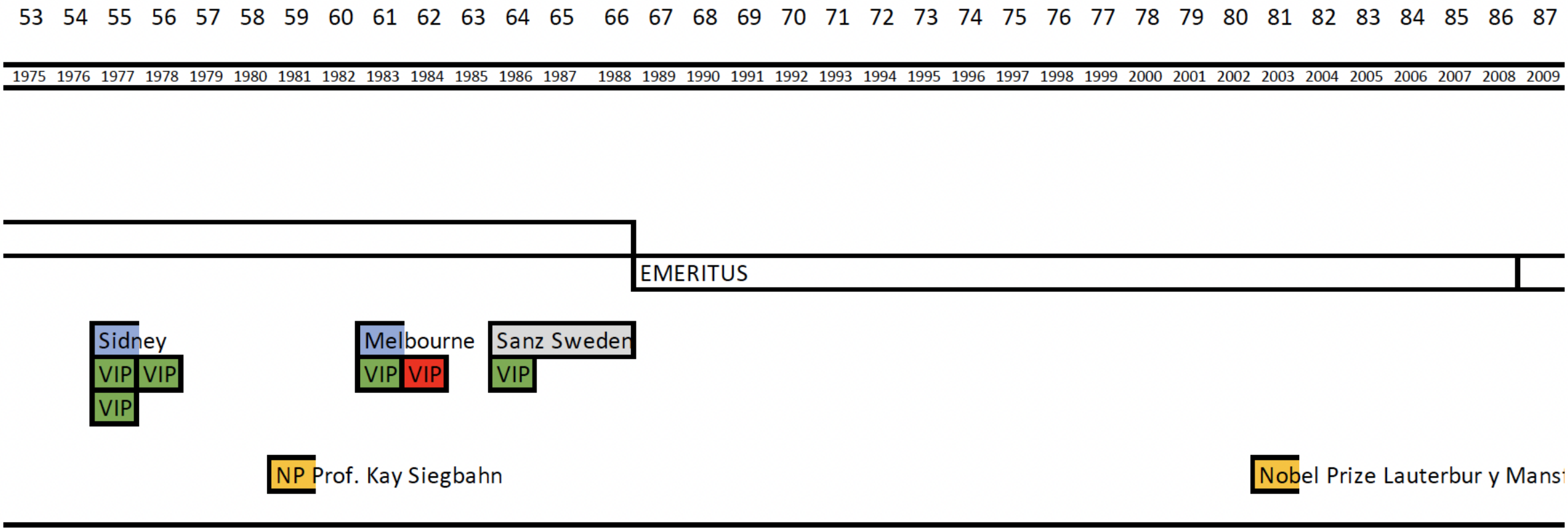
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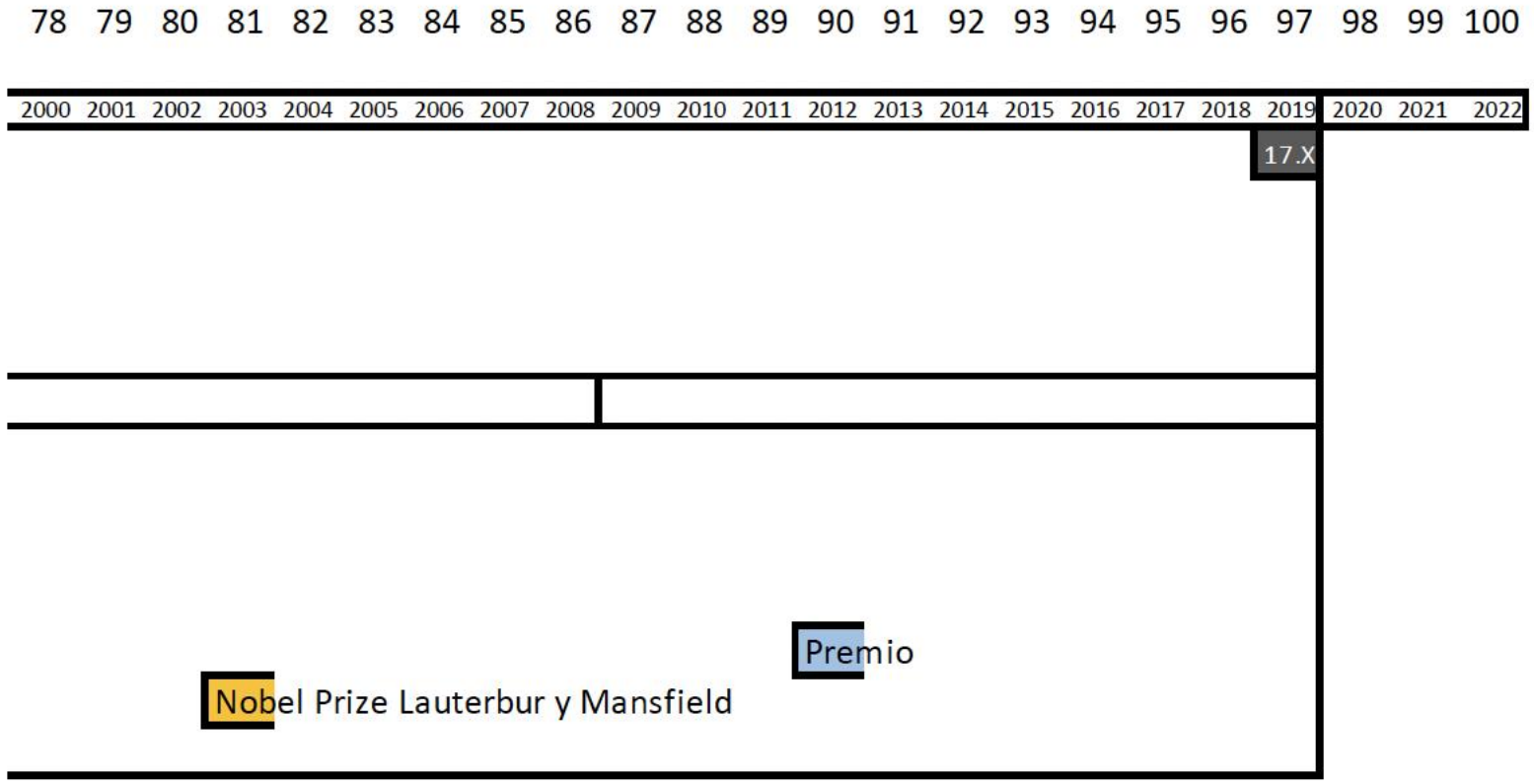
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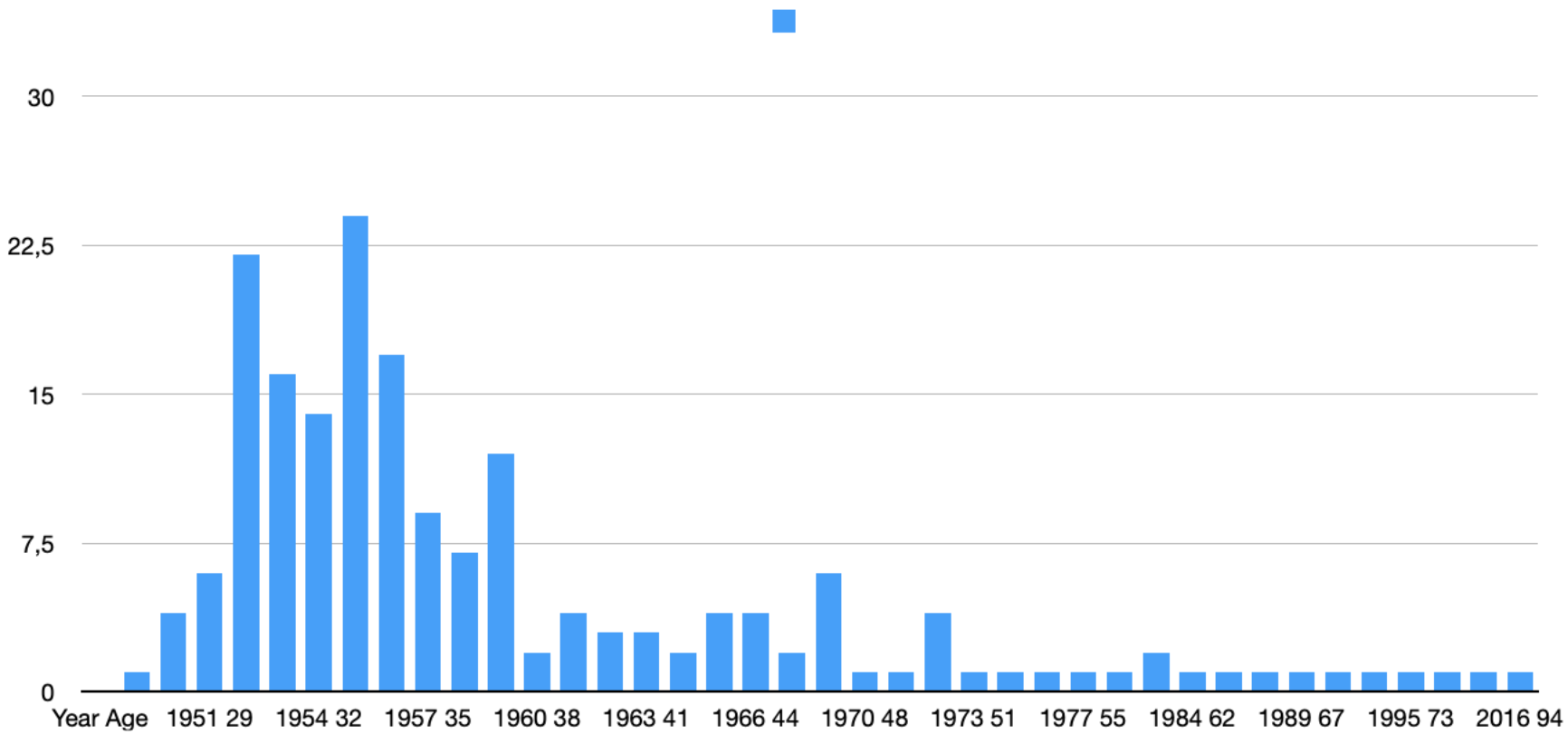
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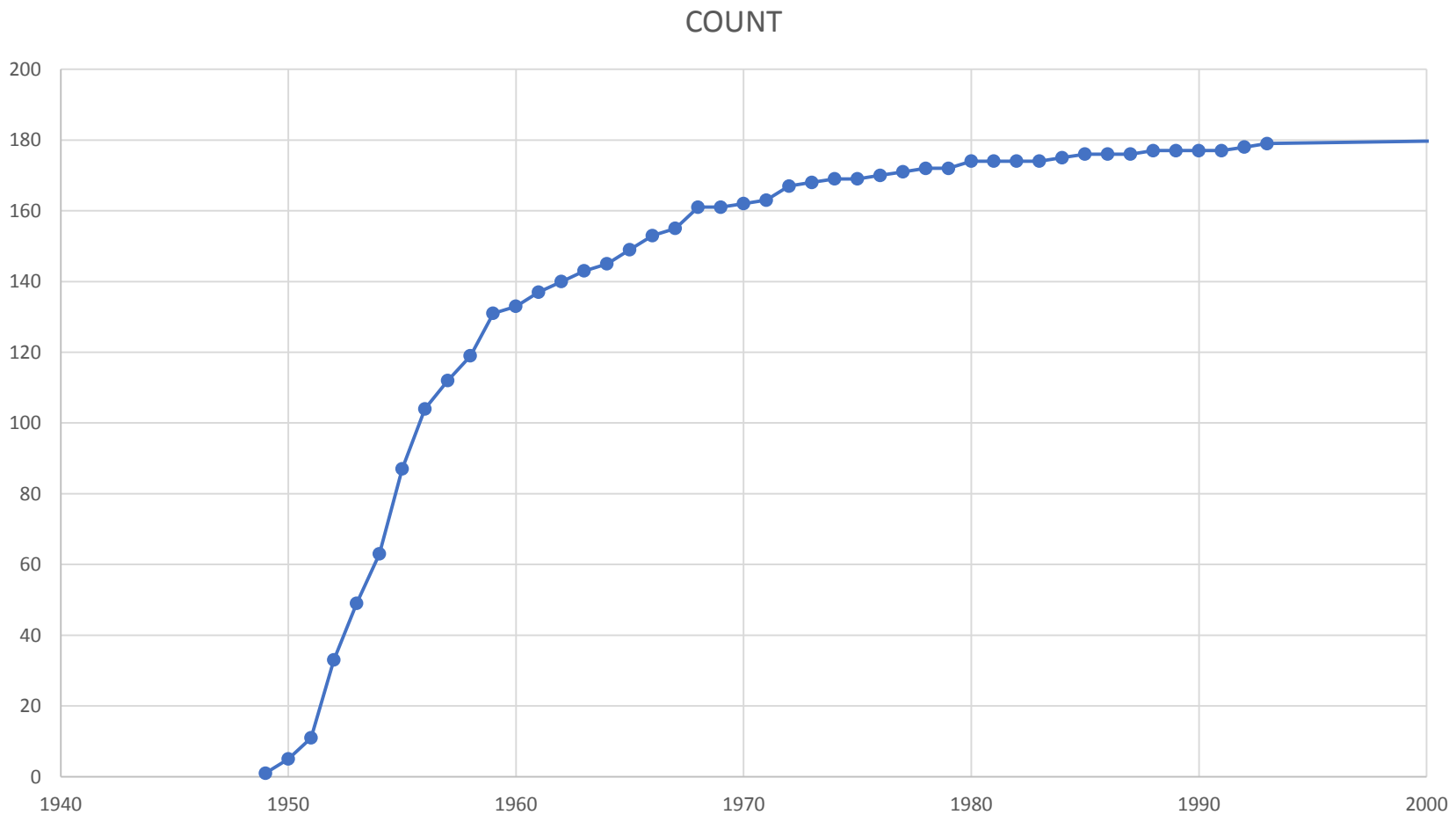
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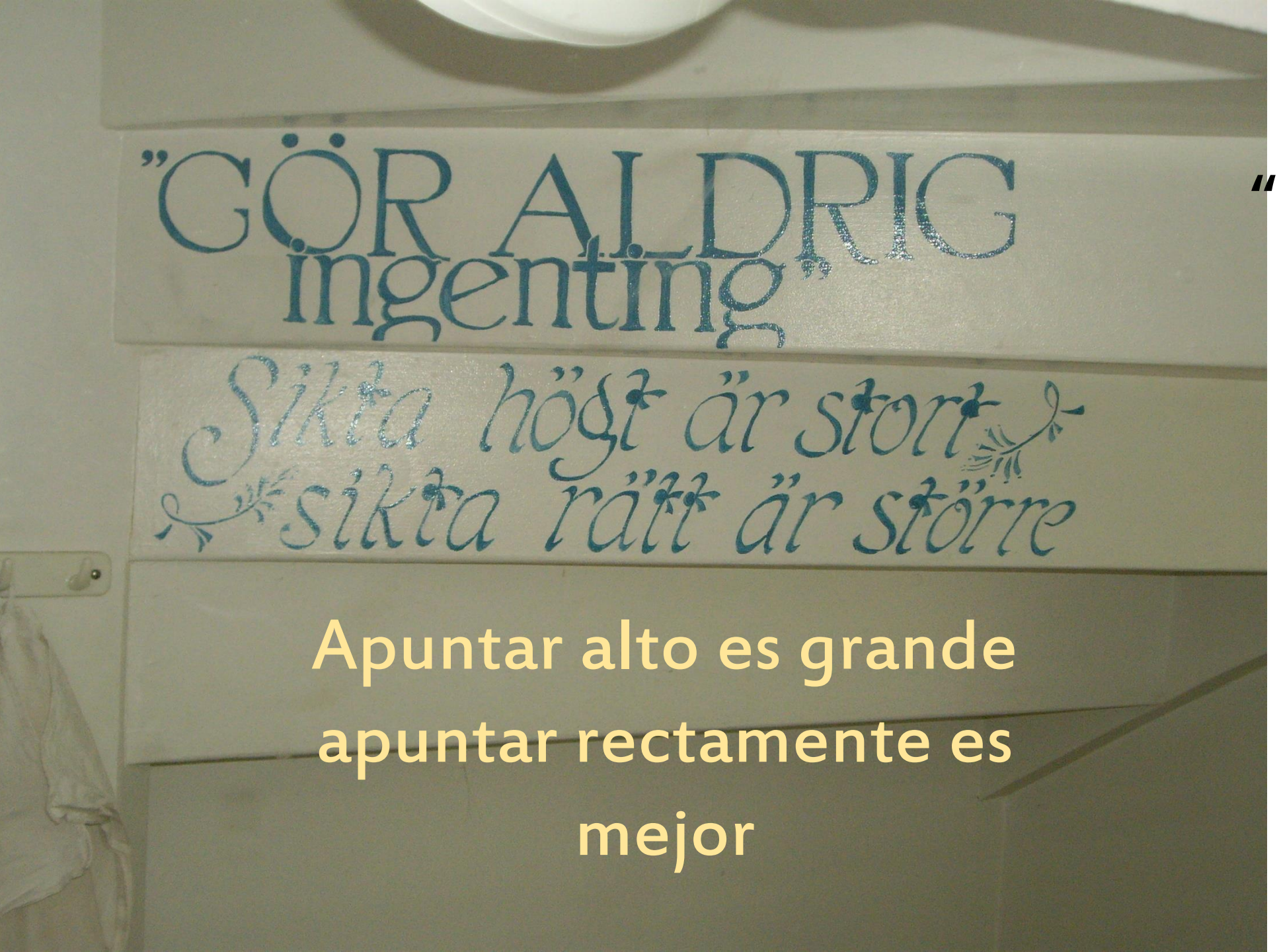
A personal Friendship….

31.1.2010 (88)


TÄNKA FRITT ÄR STORT
MEN TÄNKA RÄTT ÄR STÖRRE

"GÖR ALDRIG
ingenting"
Sikta högt är sport,
sikta lätt är sotte



Apuntar alto es grande
apuntar rectamente es
mejor

“Nunca hagas n

Erik och Sten (Bisnieto) 2018