

Discursos del Acto de Investidura  
como Doctor Honoris Causa  
del Profesor  
**Sir Salvador Moncada**



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Laudatio del Profesor  
**Sir Salvador Moncada**  
por el Profesor Doctor  
Carlos Sánchez Ferrer



Hoy celebramos la concesión a Sir Salvador Moncada el título de Doctor Honoris Causa por la Universidad Autónoma de Madrid y me corresponde la tarea introducir su figura en esta audiencia. Es, al mismo tiempo, una empresa fácil y difícil; fácil porque la excepcional carrera científica del Prof. Moncada es conocida por muchos, fuera incluso del mundo de la investigación, y sus hallazgos han modificado el tratamiento farmacológico que reciben hoy millones de personas en el mundo. Difícil, porque al tener forzosamente que resumir sus múltiples contribuciones a la Medicina cometeré omisiones por las que desde ahora mismo pido perdón.

Es tradición en estos casos comenzar por una breve reseña biográfica. Nacido en Tegucigalpa (Honduras) su familia se trasladó cuando él era aún un niño a El Salvador por razones que le han acompañado toda su vida y que en este caso afectaban a su padre: el compromiso político y social. Sus lazos con El Salvador, debido a ello, son también profundos, ya que allí estudió el Bachillerato y se incorporó a la Universidad, en la Facultad de Medicina de la Universidad de El Salvador. En ese tiempo, a modo de premonición, se produce su primer contacto con lo que después sería la Universidad Autónoma de Madrid, entonces aún inexistente. En efecto, la asignatura de Farmacología le fue impartida por un entonces joven profesor español, el Prof. Pedro Sánchez García, que unos años después fundaría y dirigiría hasta su jubilación el Departamento de Farmacología de nuestra Universidad. Ambos, profesor y alumno, recuerdan con afecto aquel tiempo y comparten la calificación de modélica para la enseñanza recibida entonces en esa su Alma Máter.

A principios de los años 70 del pasado siglo abandonó El Salvador, algo en lo que también tuvo que ver su compromiso político y social, para realizar su Tesis Doctoral en Gran Bretaña, en el Royal College of Surgeons, bajo la dirección de Sir John R. Vane. Tras una breve vuelta a Centroamérica, a mediados de los setenta, Salvador Moncada se establece definitivamente en Gran Bretaña, dentro de los Wellcome Research Laboratories, nuevamente junto a John Vane y junto a otro ilustre farmacólogo latinoamericano, el brasileño Sergio H. Ferreira (por desgracia recientemente fallecido). En estos inicios de su carrera científica realizó un trabajo fundamental, el primero de los que voy a comentar, a modo de botón de muestra, de su extensísima labor científica. En efecto, su participación fue crucial en el esclarecimiento del mecanismo de acción de los fármacos analgésicos y antiinflamatorios no esteroideos. Todos los que hoy aquí me escuchan conocen la aspirina, sintetizada hace más de 100 años por Hoffmann, pero lo que quizá muchos no sepan es hasta hace relativamente poco tiempo no se conocía con exactitud cómo funciona y qué hace en nuestro organismo. La aportación del Prof. Moncada fue esencial en el descubrimiento de la enzima tromboxano sintetasa y de la prostaciclina, así como en el balance homeostático entre prostaciclina y tromboxano, hallazgo que constituye el soporte científico de un tratamiento clave hoy en día, como es la administración de bajas dosis de aspirina, en la prevención de enfermedades cardiovasculares como el infarto de miocardio o el ictus. Estos hallazgos fueron determinantes para que Sir John R. Vane recibiera el Premio Nobel de Medicina en 1982.

El segundo gran hito de su trayectoria investigadora es la identificación como óxido nítrico (NO) de lo que hasta mediados de los años ochenta se conocía como factor endotelial derivado del endotelio (EDRF), descrito unos años antes por Robert Furchgott (Doctor Honoris Causa por la Universidad Autónoma de Madrid en 1984 y Premio Nobel de Medicina en 1998). Además, describió la vía de síntesis del NO a partir de la L-arginina, mediante enzimas que se denominaron sintetasas de NO, así como muchas de las actividades biológicas de este nuevo mediador. Su hallazgo de que el NO se genera en el Sistema Nervioso Central le llevó a hacer la propuesta de que la vía L-arginina/NO es un mecanismo



de transducción ubicuo que regula la función y comunicación celulares. Sus publicaciones acerca de estos hallazgos son clásicos de obligada cita para todos los especialistas en el área.

Su tercera gran aportación, hasta ahora, ha sido el descubrimiento de la interacción entre el NO y la enzima citocromo c oxidasa, elemento terminal de la cadena de transporte electrónico mitocondrial, que ha permitido establecer el papel del NO como regulador fisiológico de la respiración celular, y como una molécula de señalización molecular en respuesta al estrés. La interacción entre NO y oxígeno a nivel de la enzima citocromo c oxidasa y sus estudios sobre el papel del NO en la biogénesis mitocondrial están teniendo una gran relevancia en la comprensión de la fisiopatología de la diabetes mellitus tipo 2, el síndrome metabólico y la obesidad. Su interés reciente en la glicolisis y en los mecanismos bioenergéticos moleculares que coordinan la proliferación celular con la provisión de los substratos metabólicos requeridos para este proceso tiene también un alto interés para distinguir entre la proliferación normal y la patológica, característica de procesos cancerosos.

Su trayectoria profesional, siempre fuera de su patria de origen, ha sido excepcional, tanto desde el punto de vista investigador como académico. Así, en los Wellcome Research Laboratories ocupó diferentes puestos como investigador hasta alcanzar el de Director of Research en 1986. En 1996 se traslada al University College London, donde funda y dirige hasta 2011 The Wolfson Institute for Biomedical Research. En 1999, llamado por el Gobierno español, funda en Madrid el Centro Nacional de Investigaciones Cardiovasculares (CNIC), entidad que dirige hasta 2004. También ha dirigido un grupo de trabajo en el VIB Vesalius Research Center, en Lovaina, Bélgica, y desde 2014 dirige el Institute of Cancer Sciences, en la University of Manchester.

La actividad científica del Prof. Moncada durante todos estos años ha dado lugar a más de ochocientas publicaciones, incluyendo libros y artículos en revistas científicas de la más alta calidad, tanto en el área del conocimiento general (Nature, Science, etc), como en publicaciones clásicas de Medicina (New England Journal of Medicina, Lancet, etc), así como en las áreas de Farmacología,

Fisiología o Bioquímica, entre otras. Baste decir que el Prof. Salvador Moncada es uno de los autores más citados de la bibliografía científica en las últimas décadas y, concretamente, es el autor británico más citado en biomedicina durante la década de los noventa. Sin querer reabrir viejas polémicas, el trabajo del Prof. Moncada es hoy en día mucho más recordado y citado que el de otros con mayor reconocimiento septentrional. Obviamente, el Profesor Salvador Moncada ha recibido múltiples distinciones a lo largo de su vida. Es Doctor Honoris Causa por distintas universidades europeas y americanas. También es Académico en instituciones de gran prestigio (entre muchas otras, The Royal Society, The National Academy of Sciences of the USA, la Academia Europea, así como nuestra Real Academia Nacional de Medicina). Entre los múltiples premios y reconocimientos que ha recibido, destaca especialmente el Premio Príncipe de Asturias de Investigación Científica y Técnica otorgado en 1990, pero también cabe mencionar el Premio Nacional de Ciencias de la República de Honduras, la Orden del Mérito José Cecilio del Valle de la República de Honduras, el Premio de la Academia Romana de Ciencias Médicas y Biológicas, el Premio Amsterdam de Medicina de la Real Academia Holandesa de Artes y Ciencias, The Royal Medal por la Royal Society y la Medalla de Oro Ernst Jung para Medicina), entre otros, así como su nombramiento como Caballero por la Reina de Inglaterra (Knighthood for Services to Science).

Durante toda su trayectoria científica, el Prof. Salvador Moncada ha tenido siempre una especial relación con España y con la ciencia española, de modo que han colaborado con él muchos científicos españoles, incluidos por supuesto investigadores de la Universidad Autónoma de Madrid, también el que les habla, con estancias en su laboratorio y múltiples colaboraciones científicas. Asimismo, ha sido crucial su papel como fundador y primer director del CNIC, ya mencionado anteriormente, institución que actualmente tiene estrechos vínculos en investigación y docencia de posgrado con la Universidad Autónoma de Madrid.

Conviene recordar, además, que la vinculación del Prof. Moncada con nuestra Universidad es ya antigua, desde que en 1983 impartió la 2ª

Lección Conmemorativa Teófilo Hernando, invitado por el Departamento de Farmacología de nuestra Universidad, entonces dirigido por el ya citado Prof. Sánchez García, hasta su altruista participación en el Primer Simposio de Investigación en Biomedicina, en Marzo de 2014, organizado conjuntamente por la Facultad de Medicina de la Universidad Autónoma de Madrid y el Instituto de Investigaciones Biomédicas Alberto Sols (UAM-CSIC) donde el Prof. Moncada no sólo impartió una ponencia extraordinaria, sino participó activamente en la discusión de los trabajos presentados por nuestros jóvenes doctorandos. Este último aspecto define también la biografía del Prof. Salvador Moncada, en relación con su ya mencionado compromiso político y social. Acogedor siempre con los jóvenes interesados en la ciencia, ha favorecido y participado activamente en su formación, destacando sus iniciativas para promover la ciencia en los países menos favorecidos, lógicamente con especial atención a América Latina, como por ejemplo la Fundación Honduras Global para ayudar a jóvenes científicos emprendedores.

Quiero, antes de terminar, destacar algo que es muy importante para mí y creo que para el Prof. Moncada también. Su trabajo, extenso y fructífero, no ha terminado aún. Pocas cosas disgustan más a Salvador Moncada que considerar su trabajo como algo pasado y terminado. Sigue lleno de proyectos e ideas y, de manera llamativa, sorprende siempre la capacidad que le caracteriza para plantear los problemas, para hacer las preguntas adecuadas, aquellas que obligan a pensar y recapacitar, que son las fecundas y auténticamente creativas. En un mundo saturado de datos, muchas veces inútiles, lo que también sucede a menudo en la ciencia, saber ordenar y priorizar lo relevante respecto de lo superfluo, saber plantear las cuestiones correctas para conseguir las respuestas importantes es una virtud escasa y en la que el Prof. Moncada siempre ha tenido una habilidad y perspicacia asombrosas. Por eso, sabiendo que Salvador Moncada mira siempre más hacia el futuro que hacia el pasado, quiero terminar esta presentación con unos versos de Neruda que ensalzan el presente. Dicen así:

Este  
presente  
liso  
como una tabla,  
fresco,  
esta hora,  
este día  
limpio  
como una copa nueva  
-del pasado  
no hay una  
telaraña-,  
tocamos  
con los dedos  
el presente,  
cortamos  
su medida,  
dirigimos  
su brote,  
está viviente,  
vivo,  
nada tiene  
de ayer irremediable,  
de pasado perdido,  
es nuestra  
criatura,  
está creciendo  
en este  
momento, está llevando  
arena, está comiendo  
en nuestras manos,

cógelos,  
que no resbale,  
que no se pierda en sueños  
ni palabras,  
agárralos,  
sujétalos  
y ordénalos  
hasta que te obedezca,  
hazlo camino,  
campana,  
máquina,  
beso, libro,  
caricia,  
corta su deliciosa  
fragancia de madera  
y de ella  
hazte una silla,  
trenza  
su respaldo,  
pruébala,  
o bien  
escalera!

Si,  
escalera,  
sube  
en el presente,  
peldaño  
tras peldaño,  
firmes  
los pies en la madera

del presente,  
hacia arriba,  
hacia arriba,  
no muy alto,  
tan sólo  
hasta que puedas  
reparar  
las goteras  
del techo,  
no muy alto,  
no te vayas al cielo,  
alcanza  
las manzanas,  
no las nubes,  
ésas  
déjalas

ir por el cielo, irse  
hacia el pasado.  
Tú  
eres  
tu presente,  
tu manzana:  
tómala  
de tu árbol,  
levántala  
en tu  
mano,  
brilla  
como una estrella,  
tócala,  
híncale el diente y ándate  
silbando en el camino.



*Laudation of Professor  
Sir Salvador Moncada  
by Professor Doctor  
Carlos Sánchez Ferrer*





We are here today to celebrate the award to Sir Salvador Moncada of an Honorary Doctorate from the Universidad Autónoma de Madrid, and it is my task, which is both easy and difficult, to present him to this audience: easy, because the outstanding scientific career of Professor Moncada is well-known even outside the world of research and because his findings have changed the pharmacological treatment received today by millions of people worldwide; and difficult, because since I necessarily have to gloss over his many contributions to medicine, there will inevitably be omissions, for which I apologise in advance.

It is traditional in such cases to give a brief biography. Salvador Moncada was born in Tegucigalpa (Honduras). His family moved while he was still a child to El Salvador for reasons that have accompanied him throughout his life which in this case affected his father, his political and social commitment. His links with El Salvador are deep-rooted because it was there that he went to school then the Faculty of Medicine at the University of El Salvador. Back then, as a sort of premonition, he first came into contact with what was to become the Universidad Autónoma de Madrid, although it did not exist at the time. The subject of Pharmacology was taught by a young Spanish teacher, Professor Pedro Sánchez García who, several years later, was to found and direct, until his retirement, our university's Pharmacology Department. The two of them, teacher and student, have fond recollections of that time and agree that the teaching in his Alma Mater was exemplary.

In the early 1970s, he left El Salvador, also for reasons pertaining to his political and social commitment, to prepare his doctoral thesis in Great Britain, at the Royal College of Surgeons under Sir John R. Vane. Then, after a short time back in Central America, in the mid-1970s, Salvador Moncada took up residence in Great Britain, working for the Wellcome Research Laboratories, again with John Vane and alongside another well-known Latin American pharmacologist, Sergio H. Ferreira from Brazil (who unfortunately died recently). In these early years of his scientific career, he worked on an essential project, the first of the examples I shall be mentioning from his very full scientific curriculum. His participation was crucial for clarifying the mechanism by which analgesics and non-steroid anti-inflammatory drugs act. Everyone here today knows about aspirin, which was synthesised over 100 years ago by Hoffmann, but what you perhaps do not know is that until relatively recently it was not clear how it works and what it actually does within the human body. The contribution made by Prof. Moncada was essential in the discovery of the thromboxane synthetase enzyme and of prostacyclin, as well as the homeostatic balance between prostacyclin and thromboxane. This finding is behind a treatment that is key today, that is, the administration of low doses of aspirin to prevent cardiovascular diseases such as myocardial infarction or stroke. These findings led to the award of the Nobel Prize for Medicine to Sir John R. Vane in 1982.

The second main landmark in his research career was the identification as nitric oxide (NO) of what until the mid-1980s had been known as the endothelium-derived relaxing factor (EDRF), which had been described a few years before by Robert Furchgott (who received an Honorary Doctorate from the Universidad Autónoma de Madrid in 1984 and the Nobel Prize for Medicine in 1998). Dr Moncada also described the path for nitric oxide synthesis from L-arginine by means of enzymes that were called NO synthases, as well as many of the biological activities of this new mediator. His finding that nitric oxide is generated in the central nervous system led him to propose that the L-arginine/NO path is a ubiquitous transduction mechanism that regulates cell function and

communication. His publications on these findings are classic references for all specialists in this area.

His third great contribution, so far, is the discovery of the interaction between NO and the enzyme cytochrome c oxidase, the terminal element in the electron transport chain of mitochondria which has made it possible to establish the role of NO as the physiological regulator of cell respiration and as a signalling molecule in response to stress. The interaction between NO and oxygen at the level of the cytochrome c oxidase enzyme and his studies on the role of NO in mitochondrial biogenesis are becoming very relevant for explaining the physiopathology of diabetes mellitus type 2, metabolic syndrome and obesity. His recent interest in glycolysis and in the molecular bioenergy mechanisms that coordinate cell proliferation with the provision of the metabolic substrates that are required for this process is also of great interest for distinguishing between normal proliferation and the pathological proliferation that is characteristic of cancer processes.

His professional career, always outside his country of origin, has been exceptional from both the research and academic points of view. At the Wellcome Research Laboratories he held various research positions, becoming Director of Research in 1986. In 1996 he transferred to University College London, where he founded and led, until 2011, the Wolfson Institute for Biomedical Research. In 1999, he was called upon to set up the Spanish National Centre for Cardiovascular Research (*Centro Nacional de Investigaciones Cardiovasculares - CNIC*) in Madrid, which he directed until 2004. He also led a working group at the VIB Vesalius Research Centre, in Louvain, Belgium, and since 2014 has been director of the Institute of Cancer Sciences, at the University of Manchester.

The scientific activity of Professor Moncada over all these years has led to over eight hundred publications, including books and articles in scientific journals of the highest quality in the area of general knowledge (Nature, Science, etc.) and in classic medical publications (New England Journal of Medicine, the Lancet, etc), as well as in the areas of Pharmacology,

Physiology and Biochemistry, amongst others. Prof. Salvador Moncada is one of the writers with most citations in the scientific literature over recent decades and, more specifically, is the British author with most citations in biomedicine during the 1990s. Without going into the controversies of the past, the work of Professor Moncada is cited and remembered much more than that of others who received greater recognition from the north. Obviously, Professor Salvador Moncada has received many distinctions during the course of his life. He holds honorary doctorates from various European and American universities, and is a Fellow of the Royal Society and a member of the National Academy of Sciences of the USA, the European Academy and the Spanish Royal National Academy of Medicine. Among the many awards he has received are the Prince of Asturias Award for Scientific and Technical Research granted in 1990, the National Award for Science of the Republic of Honduras, the José Cecilio del Valle Order of Merit from the Republic of Honduras, the Award from the Roman Academy for Medical and Biological Sciences, the Amsterdam Award for Medicine of the Dutch Royal Academy for Arts and Sciences, the Royal Medal from the Royal Society and the Ernst Jung Gold Medal for Medicine. He also received a Knighthood for Services to Science from the Queen of England.

Throughout his career, Professor Salvador Moncada has had a special relationship with Spain and Spanish science, and many Spanish scientists have collaborated with him, some of them from the Universidad Autónoma de Madrid, including myself, with stays at his laboratory and many scientific collaborations. His role as founder and first director of the CNIC was crucial, and this institution still has close ties with the Universidad Autónoma de Madrid in research and postgraduate teaching.

It should also be remembered that Professor Moncada's links with our university go back over many years. In 1983 he gave the 2<sup>nd</sup> Teófilo Hernando Commemorative Lecture, at the invitation of our Pharmacology Department which was headed at the time by Professor Sánchez García. And recently he participated altruistically in the First Symposium on Research

in Biomedicine in March 2014, organised jointly by the Faculty of Medicine of the Universidad Autónoma de Madrid and the Alberto Sols Institute for Biomedical Research (UAM-CSIC). On that occasion, not only did Professor Salvador Moncada give a memorable talk but he also participated actively in the discussion on work presented by our young doctoral students. This takes us back to his biography in relation to what I said about his political and social commitment. He has always been open to young people interested in science, actively participating in their training and supporting initiatives to promote science in less advanced countries, especially in Latin America. An example is the Honduras Global Foundation which aims to help young scientific entrepreneurs.

Before I close, I would like to stress something that is very important for me and, I believe, also for Prof. Moncada. His work has been extensive and fruitful, but it is not over. There can be few things that Salvador Moncada likes less than considering his work as something that is complete and finished. He still has many projects and is full of ideas, and he never ceases to surprise with his capacity for dealing with problems, for asking the right questions, the ones that will force us to think and re-think, the ones that are truly fruitful and creative. In a world that is saturated with data, much of which is of little or no use – and this also happens in science – knowing how to give priority to what is relevant and not superfluous, knowing how to ask the right questions to get important answers is a rare virtue and one in which Professor Moncada has always had remarkable skill and perspicacity. Since I know that Salvador Moncada always prefers to look towards the future rather than the past, I would like to close with a poem by Pablo Neruda in praise of the present:

*This present moment,  
smooth as a board,  
this crisp hour; this day  
pure as a new cup,  
no cobwebs from the past,  
with our fingers  
we touch the present,  
we cut it to size,  
we guide it as it unfolds,  
it is living, alive,  
it contains nothing  
of an irreparable past,  
of a lost past,  
it is our infant,  
growing at this very moment,  
taking sand, eating from our hands,  
take it, don't let it slip away,  
don't lose it in dreams or words,  
hold it, tie it,  
and order it  
until it obeys you,  
make it into a road,  
a bell, a machine,  
a kiss, a book,  
a caress,  
cut its delicious  
fragrance of wood  
and make a chair;*

*braid its back, test it  
or build a staircase!*

*Yes, a staircase,  
climb up to the present,  
step by step,  
stand firm on the wood  
of the present,  
up, up, not very high,  
just so you can repair  
the dripping roof,  
not very high, not all the way to heaven,  
reach for apples,  
not for the clouds.  
let the clouds scud across the sky  
into the past.*

*You are your present,  
your own apple,  
pick it from your tree,  
raise it in your hand,  
it shines, like a star;  
touch it,  
take a bite  
out of the present,  
and walk away,  
whistling as you go.*







Discurso de Investidura  
del Profesor  
**Sir Salvador Moncada**



Es motivo de gran alegría asistir a este acto solemne para recibir un Doctorado Honoris Causa. Un agradecimiento especial para el Profesor Carlos Sánchez Ferrer por su generosa presentación y por haber sido el gestor principal de este reconocimiento.

Me unen a este país, a su gente y también a esta Universidad, lazos de colaboración y de profunda amistad. Todo comenzó a partir de los años 60 del siglo pasado cuando tuve el privilegio de tener como profesor de Farmacología a Don Pedro Sánchez García, en la Universidad de El Salvador, adonde realicé mis estudios de Medicina.

Desde muy temprano, mi interés por la investigación científica fue mi motivación principal y he tenido la buena fortuna de que la vida me haya brindado las condiciones necesarias para perseguir esta pasión sin restricciones y sin trabas.

En los primeros años trabajé en el mecanismo de acción de la aspirina y fármacos similares. Después de nuestro descubrimiento de la Prostaciclina, estudié el endotelio vascular, la trombosis y la aterosclerosis. El tercer periodo comprende el descubrimiento del Óxido Nítrico y la investigación de sus acciones biológicas. Finalmente, en los últimos años, he trabajado en el papel bioenergético de las mitocondrias y en problemas relacionados con el metabolismo de la proliferación celular.

Cada cambio de tema se dio, porque en un determinado momento, hubo una observación o una idea que generó preguntas interesantes que prometían

llevarnos a áreas fértiles de trabajo y cada área de trabajo ha sido una aventura, en el buen sentido de la palabra.

La investigación científica comprende dos tipos de actividad: la colección detallada y rigurosa de datos que acumula cantidad y afina el conocimiento y la imaginación vagabunda que busca, se equivoca, busca de nuevo y, de vez en cuando, descubre aspectos nuevos de la realidad que transforman el conocimiento. Ambas actividades van de la mano y no puede existir una sin la otra.

Yo creo que nosotros hemos hecho más de lo segundo y nuestra contribución ha sido la de encontrar preguntas y proveer respuestas iniciales que han sido como puertas hacia nuevos conocimientos. Hacer preguntas e imaginar respuestas es para mí la ocupación más placentera de la ciencia. Además, pienso que aprender a hacer preguntas y evaluarlas para decidir cuáles se deben perseguir, es lo más importante del quehacer científico: ¡el corazón de la ciencia! La otra parte de ese corazón es el diseño y la realización del experimento que pone a prueba la pregunta.

Ahora bien, pienso que al laboratorio solamente se debe ir después de mucho pensar, pues para decidir qué es lo que hay que hacer y por dónde hay que ir, es necesario descartar de antemano muchas preguntas, al parecer atractivas, que no llevan a ningún lugar. Para perseguir una idea hay que descartar primero otras diez, o tal vez cien....

Mi método ha sido el de observar un problema y tratar de simplificarlo hasta identificar sus componentes esenciales y después, hacer preguntas sencillas que puedan ser sometidas al método experimental. Estoy convencido de que la naturaleza sólo cede sus secretos a quien hace preguntas adecuadas y de estas, las más sencillas son siempre las mejores.

El comienzo de toda investigación es una pregunta, seguida de un intento de respuesta generalmente no bien elaborado: la hipótesis inicial de trabajo. La experimentación provee datos que refinan la hipótesis y de esa manera se convierte en un modelo más preciso que vuelve a someterse al experimento y así sucesivamente, en un acercamiento asintótico a la realidad que siempre genera

respuestas tentativas. Como resultado, yo no concibo la investigación sin una hipótesis de trabajo y no entiendo el conocimiento como definitivo y/o absoluto en ningún momento.

Hacer preguntas y someterlas al escrutinio experimental, aunque ligadas la una a la otra, son actividades regidas por reglas muy distintas. La diferencia más importante es que, para hacer preguntas, se necesita imaginación a la que debe dársele todo el vuelo y flexibilidad. Una vez hecho eso, en el laboratorio, lo primero que se descarta es la imaginación, y con experimentos bien diseñados, hay que recoger el dato, cuya veracidad y precisión están en la base de la generación de conocimiento. Esa es la razón por la cual, en ciencia, la imaginación sin datos es tan inútil como lo son los datos sin imaginación.

El juego entre la imaginación y el dato, en el que en última instancia el dato es decisivo, es un ejercicio maravilloso que nos acerca a la realidad. ¡No hay nada más estimulante que la situación en la cual, a veces y casi por casualidad, logramos entrever que la realidad funciona, por lo menos en algunos de sus aspectos, tal como la habíamos imaginado!

Y eso es, efectivamente, lo importante del dato. El dato en sí no es más que una simple colección de hechos recogidos sistemáticamente y expresados de una forma utilizable. El dato en sí no tiene mucho secreto. Las implicaciones del dato son lo más importante, como ayuda a explicar el pasado e ilumina el futuro y como va permitiendo entretejer nuestras interpretaciones, siempre tentativas, de la realidad que nos rodea.

El dato es siempre mejorable y por eso, aún cuando el dato se adquiera de la manera más rigurosa y con los mejores instrumentos disponibles, el dato siempre es sospechoso y debe de estar sujeto a escrutinio permanente, lo mismo que nuestra visión de la realidad. La calidad del dato depende siempre de la sofisticación del instrumento que se usa para recogerlo y el instrumento depende del momento histórico en que se hace la medición.

Las respuestas tentativas de la ciencia son siempre modificables. Por eso, la ciencia experimental está basada en la realización de experimentos orientados a destruir nuestras ideas, nuestras hipótesis, no a demostrar su veracidad. Sólo las

hipótesis que sobreviven el bombardeo experimental se mantienen, las otras se descartan sin miramientos.

La generación de nuevo conocimiento, entonces, no se mueve como una actividad sistemática de construcción continua y paso a paso, cada uno lógicamente después del otro. Se mueve dialécticamente, de tal forma que periodos de crecimiento sistemático y cuantitativo son seguidos de saltos de calidad que cambian el paradigma de investigación. La verdad es que el nuevo conocimiento no surge de la simple acumulación cuantitativa de información, el nuevo conocimiento surge, para ponerlo de una manera figurada, de entre las grietas del conocimiento que en un momento determinado parecía completamente sólido. De allí mi insistencia en que la información científica no debe leerse para atiborrarse la cabeza de datos, sino para encontrar los puntos débiles de un discurso al parecer coherente.

La reducción a la práctica es un buen criterio de veracidad y siempre, al final de todo el trabajo, quedan algunos conceptos que, aunque sin ser verdad absoluta, pueden ser reducidos a la práctica y por lo tanto son aplicables.

En nuestro trabajo hay algunas conclusiones que alcanzan esta categoría, entre otras, la definición del mecanismo de acción de la aspirina y fármacos similares, que ha servido de base para la explicación de su acción terapéutica, para la comprensión más clara de los mecanismos envueltos en los procesos inflamatorios y para el desarrollo de nuevos medicamentos. El siguiente es el descubrimiento de la prostaciclina. Íntimamente unido al trabajo anterior, abrió las puertas para una comprensión más clara del papel del endotelio vascular y del uso de pequeñas dosis de aspirina para la prevención de las enfermedades cardiovasculares. Y además, el descubrimiento del óxido nítrico con sus múltiples papeles biológicos, notablemente, su papel en el control de la presión arterial y el flujo sanguíneo.

La verificación en la práctica es el punto en el cual la ciencia puede contribuir a la sociedad que la cuida y la financia. Para los que hacemos investigación biomédica eso sucede con relación a la preservación de la salud, la cura de la enfermedad y a la posibilidad de mejorar la vida de los seres humanos. En

general, el mejor conocimiento de la realidad debería ser siempre usado con el propósito generoso de mejorar la vida y el bienestar de la humanidad.

Finalmente, me siento privilegiado por haber tenido la oportunidad de pasar la mayor parte de mi vida dedicado a investigación científica, que es mi pasatiempo preferido. El Reino Unido me ha brindado condiciones ideales de trabajo y he encontrado en el camino, estudiantes, profesores y colegas excepcionales, varios de ellos de este país, que me han inspirado, estimulado y apoyado a través de los años. A todos ellos va mi agradecimiento profundo.

Quiero agradecer nuevamente la generosidad de esta Universidad, que ahora me acoge en su claustro, dentro del cual prometo hacer mis mejores esfuerzos para contribuir en su vida académica y en su papel tan importante de fomentar el beneficio de la sociedad. El período histórico que vivimos está caracterizado por vertiginosas transiciones tecnológicas sociales, y culturales, llenas de peligro pero también llenas de promesas. Es tarea de los centros pensantes, jugar un papel decisivo en la elección del camino a seguir y para eso, no hay nada mejor que el método científico.

Señor Rector, Autoridades, queridos compañeros, miembros de mi familia cercana que hoy me acompañan y que me comprenden y me apoyan siempre.

Muchas gracias!





*Inaugural Address*  
*by Professor*  
*Sir Salvador Moncada*



I am delighted to attend this solemn ceremony to receive an honorary doctorate. I would like to express special thanks to Professor Carlos Sánchez Ferrer for his generous presentation and for having been the main proponent of this recognition.

I have strong links with this country and this university and have many good friends in Spain. Everything started in the 1960s when I had the privilege of being taught Pharmacology by Professor Pedro Sánchez García at the University of El Salvador where I studied medicine.

From a very early age, my main interest was scientific research and I have had the good fortune that life has offered me the conditions in which I could pursue this passion without limits or obstacles.

During the early years, I worked on the mechanism of aspirin and similar drugs. After our discovery of prostacyclin, I studied the vascular endothelium, thrombosis and atherosclerosis. The third period included the discovery of nitric oxide and research into its biological actions. Finally, in recent years I have been working on the bio-energetic role of mitochondria and problems relating to the metabolism of cell proliferation.

Every time the topic changed, it was because a comment was made or an idea expressed that generated a question, one that promised to lead to fertile areas of work, each of which turned out to be an adventure in the best sense of the word.

Scientific research covers two types of activity: detailed and careful compilation of data that refines our knowledge, and a wandering imagination

that searches, makes mistakes, searches again and, sometimes, discovers new aspects of reality that transform our knowledge. The two activities go hand in hand and cannot exist independently.

I think we have done more of the second of these, and our contribution has been to find questions and then provide initial answers that have served as doors leading to new knowledge. For me, asking questions and thinking up answers is the most pleasurable occupation in science. And I think that asking questions and deciding which of them should be pursued is what is most important in scientific activity. It is the heart of science. The other part of the heart is the design and implementation of the experiment that try to answer our questions.

But I think a researcher should only go to the laboratory after devoting a lot of time to thought. Before you can decide what should be done or in what direction you should move, many initial questions have to be set aside, however attractive they might seem, because they will take you nowhere. To pursue an idea, you first have to discard ten, or perhaps a hundred, ideas ....

My method has been to observe a problem and try to simplify it until I can identify its key components. I then ask simple questions that can be subjected to experimentation. I am convinced that nature only reveals its secrets to those who ask the right questions, and the simplest questions are always the best.

Any research begins with a question, followed by a draft answer, the initial working hypothesis. Experimentation provides data that refine the hypothesis, which then becomes a more precise model that is again tested with experimentation and so on, in an asymptotic approach to reality that always generates tentative answers. I therefore consider that research cannot exist without a working hypothesis, and I never see knowledge as being final and/or absolute.

Asking questions and subjecting them to experimental examination are activities that are related but are governed by very different rules. The most important difference is that, in order to ask questions, you need to give free rein to your imagination. Once this is done, in the laboratory, the first thing you have to set aside is your imagination. With well-designed experiments, you have to

collect the data and only if the data are accurate and precise will you be able to generate knowledge. This is why, in science, imagination without data is as useless as data without imagination.

The game played between imagination and data, in which data will ultimately be decisive, is a wonderful exercise that brings us close to reality. There is nothing more exciting than a situation in which, sometimes and almost by chance, we manage to see how reality works, at least in some of its aspects, just as we had imagined!

And this is what is important about data. Data are merely facts that have been systematically compiled and are expressed in a way that can be used. Data alone reveal no secrets. The implications of data are what matter. They help us explain the past and light up the future and allow us to weave our interpretations, which will always be tentative, of the reality surrounding us.

Data can always be improved. Even when they are obtained in the most rigorous fashion and using the best tools available, they should always be suspect and must be subject to permanent scrutiny, as must our view of reality. Data quality always depends on the sophistication of the tool used to compile them, and the tool depends on the time in history at which the measurement is made.

In science, tentative answers are always changeable. For this reason, experimental science is based on experiments that aim to destroy our ideas, our hypotheses, rather than to show the truth. Only the hypotheses that survive this barrage of experiments will remain. Any others must be set aside without further ado.

So the generation of new knowledge does not move like a systematic building activity, one step after another. It moves dialectically, in such a way that periods of systematic and quantitative growth are followed by leaps in quality that change the research paradigm. New knowledge does not arise out of a mere quantitative accumulation of information. It can be said to appear through the cracks of knowledge that at one time seemed totally sound. This is why I insist that scientific information should not be read to fill your head with data but to find the weak points in an apparently coherent discourse.

Implementation in practice is a good criterion for veracity and always, at the end of all the work, there are still some concepts that, while not absolute truth, can be implemented in practice so are applicable.

In our work, there have been some conclusions that reach this category, including the definition of the mechanism of aspirin and similar drugs, which provided a basis for explaining their therapeutic action, for more clearly understanding the mechanisms involved in inflammatory processes and for the development of new drugs. The next was the discovery of prostacyclin. This was closely linked to the previous research and opened up the path for a better understanding of the role of the vascular endothelium and the use of small doses of aspirin to prevent cardiovascular diseases. Also, the discovery of nitric acid with its multiple biological roles, especially in the control of blood pressure and blood flow.

Verification in practice is the point at which science can contribute to the society that cares for it and finances it. For those of us who do biomedical research, this takes the form of health care, curing diseases and improving the lives of human beings. In general, better knowledge of reality should always be used with the generous purpose of improving the lives and wellbeing of mankind.

Finally, I consider myself to have been privileged because I have had the opportunity to spend most of my life doing scientific research, my favourite pastime. The United Kingdom has provided me with ideal working conditions in which I have come across exceptional students, teachers and colleagues, several of them from this country, who have inspired, encouraged and supported me over the years. I am deeply grateful to them all.

I would once again like to thank this university for its generosity for including me now within its teaching staff. I promise to make every effort to contribute to its academic life and to its very important role of benefiting society. The historic times we live in are characterised by fast-moving technological, social and cultural changes that entail many risks but also great promise. It is up to the centres of thinking to play a decisive role in choosing the path to be followed, for which there can be nothing better than scientific method.

Distinguished Rector, authorities, colleagues, members of my close family who are with me today and who understand me and always support me, thank you all very much.





Curriculum Vitae del Profesor  
Sir Salvador Moncada

*Professor Sir Salvador Moncada's CV*



## CURRICULUM VITAE

**Name:** Prof Sir Salvador Moncada  
**Place of birth:** Tegucigalpa, Honduras, 3 December, 1944  
**Webpage:** [www.margaretatwood.ca](http://www.margaretatwood.ca).

### Education

- 1957-1961** › Instituto Nacional, San Salvador, El Salvador. Secondary School.  
**1962-1970** › School of Medicine, University of El Salvador.  
**1970** Doctor of Medicine and Surgery.  
**1971-1973** Royal College of Surgeons, University of London, Department of Pharmacology.  
**1974** › Doctor of Philosophy (Pharmacology).  
**1983** › Doctor of Science, University of London.

### Experience

- 1969** › General Practitioner in the Social Service of El Salvador  
**1969-1970** › Instructor of Preventive Medicine, Public Health, School of Medicine, University of El Salvador.  
**1970-1971** › Instructor of Physiology, Pharmacology, Dept. of Physiological Sciences, School of Medicine, University of Honduras.  
**1971-1973** › Royal College of Surgeons, Dept. of Pharmacology The Wellcome Research Laboratories, England.  
**1974-1975** › Associate Professor of Pharmacology and Physiology, Dept. of Physiological Sciences, School of Medicine, University of Honduras.  
**1975-1977** › Section Leader. Prostaglandin Research Group. Senior Scientist, Wellcome Research Laboratories, England.  
**1977-1985** › Head of Department of Prostaglandin Research, Wellcome Research Laboratories, England.

- 1984-1986** › Director of the Therapeutic Research Division, Wellcome Research Laboratories, England.
- 1986-1995** › Director of Research (U.K.).  
Wellcome Research Laboratories, England.
- 1996-2011** › Professor of Experimental Biology and Therapeutics and Director The Wolfson Institute for Biomedical Research (formerly known as The Cruciform Project for Strategic Medical Research), University College London.
- 2011-2013** › Professor of Experimental Biology and Therapeutics, The Wolfson Institute for Biomedical Research.
- 1999-2004** › Founder and Director of the Centro Nacional de Investigaciones Cardiovasculares (CNIC) in Madrid, Spain.
- 2010-2014** › Group Leader, VIB Vesalius Research Centre, Leuven, Belgium.
- 2013** › Emeritus Professor University College London, England.
- 2013** › Professor of Translational Medicine & Strategic Adviser, Institute of Human Development, University of Manchester, England.
- 2014** › Institute Director of Cancer Sciences, Faculty of Medical and Human Sciences, University of Manchester.

## Societies

- 1974** › Member of the British Pharmacological Society.
- 1982** › Honorary Member of the Colombian Society of Internal Medicine.
- 1983** › Honorary Member of the Peruvian Pharmacological Society.
- 1984** › Correspondent member of the Cuban Society of Cardiology.
- 1988** › Fellow of The Royal Society.
- 1988** › Fellow of the Third World Academy of Sciences.
- 1992** › Member of Academia Europaea.
- 1993** › Corresponding Member of the Gesellschaft der Artzte in Wien.
- 1994** › Fellow of the European Society of Cardiology.

- 1994** › Elected Honorary Member of the Mexican Society of Arterial Hypertension.
- 1994** › Foreign Member of the National Academy of Sciences of the United States of America.
- 1994** › Fellow of the Royal College of Physicians, London.
- 1994** › Foreign Member of the Faculty of Medicine of the Polish Academy of Arts and Sciences at Krakow.
- 1995** › Honorary Member of the National Academy of Medicine, Mexico.
- 1995** › Honorary Member of the Ecuadorian Academy of Science.
- 1995** › President, Medical Sciences Section of the British Association for the Advancement of Science.
- 1995** › Honorary Fellow of the Royal Academy of Medicine of the Basque Country, Spain.
- 1995** › Honorary Fellow of the Academy of Medical Sciences of Bilbao, Spain.
- 1996** › Election to The Royal Academy of Medicine of Catalonia, Spain.
- 1996** › Corresponding Foreign Member of the National Academy of Medicine, Buenos Aires, Argentina.
- 1997** › Honorary Member of the Association of Physicians of Great Britain and Ireland.
- 1997** › Honorary Member of the Honduran Society of Neurology and the Honduran Society of Epilepsy.
- 1997** › Honorary Member of the Central American Federation of Neurology.
- 1997** › Honorary Member of the Dominican Society of Cardiology.
- 1998** › Founder Fellow of the Academy of Medical Sciences, London.
- 1999** › Honorary Member of the Academy of Medicine of Torino, Italy.
- 1999** › Honorary Fellow of University College London.
- 1999** › Honorary Member of the American Society of Hematology.
- 1999** › Honorary member of the Spanish Society of Biochemistry and Molecular Biology.

- 1999** ․ Liveryman of the Worshipful Society of Apothecaries of London.
- 2000** ․ Corresponding Member of the Latin American Academy of Sciences.
- 2000** ․ Honorary Foreign Member of the Koninklijke Academie voor Geneeskunde van België.
- 2005** ․ Fellow of the Accademia Nazionale Dei Lincei, Italy.
- 2005** ․ Honorary Member of the Society for Endocrinology.
- 2006** ․ Member of the European Molecular Biology Organisation.
- 2008** ․ Honorary Member of the Finnish Pharmacological Society.
- 2010** ․ Honorary Member of the Panamanian Association for the Advancement of Science.
- 2010** ․ Honorary Member of the Physiological Society, London.

## Honours, Awards and Distinguished Lectures

- January 1980** ․ Peter Debeye Prize, University of Limburg, Belgium.
- April 1980** ․ Rokitansky Lecture, Vienna, Austrian Association for Morphological and Functional Research in Atherosclerosis, Austria.
- April 1980** ․ Pfizer Lecture in Clinical Pharmacology (New York Medical College), USA.
- December 1980** ․ VIII Gaddum Memorial Lecture (British Pharmacological Society), UK.
- March 1981** ․ Bernard Mornington Lecture, European Society for Clinical Investigation, Basle, Switzerland.
- May 1981** ․ Waldenstrom Lecture, Malmö, Sweden.
- May 1981** ․ The Karl de Gruchi Lecture, Melbourne, Australia.
- April 1983** ․ Teofilo Hernando Memorial Lecture Autonomous University of Madrid, Spain.
- November 1985** ․ National Science Prize of the Republic of Honduras.
- January 1986** ․ The First Lorenzo Velasquez Memorial Lecture Universidad Complutense de Madrid, Madrid, Spain.

- July 1987** ․ Rocha e Silva Memorial Lecture, Rio de Janeiro, Brasil.
- July 1989** ․ First Robert. F. Furchgott Lecturer, awarded by The Scientific Committee of “Mechanisms of Vasodilatation”, Strasbourg, France.
- August 1989** ․ The Ajinomoto Prize for Amino Acid Research (jointly with Dr. R.M.J. Palmer), Japan.
- December 1989** ․ Ham Wasserman Lecture, American Society of Hematology, USA.
- October 1990** ․ Prince of Asturias Prize for Science and Technology jointly awarded with Prof. Santiago Grisolia, Oviedo, Spain.
- November 1990** ․ Order of Merit “Jose Cecilio del Valle” Republic of Honduras.
- February 1991** ․ Ulf von Euler Memorial Lecture, Karolinska Institute, Stockholm, Sweden .
- April 1991** ․ Boerhaave Lecture, European Society for Clinical Investigation, Pisa, Italy.
- June 1991** ․ XVI Lorenzini Gold Medal for Scientific Merit and Lorenzini Annual Lecture for 1991, Italy.
- October 1991** ․ Great Medal of the Departement du Rhone, Lyon, France.
- October 1991** ․ The Sixth Annual Harry Barowsky Clinical Research Lecture, New York Medical College, USA .
- November 1991** ․ The Ariens Lecture, Dutch Pharmacological Society, Utrecht University, The Netherlands.
- November 1991** ․ The Paul Dudley White Lecture, American Heart Association, Anaheim, California, USA.
- December 1991** ․ “Atomo d’Oro” - Prize of the Roman Academy of Medical and Biological Sciences, Rome, Italy.
- February 1992** ․ The Esko Nikkila Memorial Lecture, Finnish Society of Internal Medicine, Finland.
- March 1992** ․ The Twenty-Second Annual Schueler Distinguished Lecture in Pharmacology, Tulane University School of Medicine, USA.

- May 1992** ․ American Society of Hypertension Special Lecture 1992, USA.
- September 1992** ․ The Sir David Cuthbertson Lecture, European Society of Parenteral and Enteral Nutrition, Vienna, Austria.
- September 1992** ․ The Amsterdam Prize for Medicine awarded by The Royal Netherlands Academy of Arts and Sciences, The Netherlands.
- February 1993** ․ The Harveian Lecture, The Harveian Society of London, UK.
- February 1993** ․ Sanofi Winthrop Visiting Professor of Clinical Pharmacology, University of Edinburgh, UK.
- February 1993** ․ John Mallet Purser Lecture, Trinity College, Dublin, Ireland.
- April 1993** ․ Vith Trabucchi Foundation Annual Lecture, Fondazione Emilio Trabucchi, Milan, Italy.
- July 1993** ․ The Arthur Bloom Memorial Lecture, International Society for Thrombosis & Haemostasis, New York, USA.
- September 1993** ․ The Ewing Halsell Lecture, The University of Texas Health Science Center at San Antonio, USA.
- September 1993** ․ The 1993 Stephen Paget Memorial Lecture, Research Defence Society Symposium, University of Southampton meeting of the Physiological Society, UK.
- October 1993** ․ The I.S. Ravdin Lecture in the Basic Sciences, awarded by The American College of Surgeons, USA.
- October 1993** ․ The Owren Lecture, University of Oslo, Norway.
- October 1993** ․ The Annual Clinical Science Lecture of the Karolinska Institute, Huddinge Hospital, Sweden.
- November 1993** ․ The 22<sup>nd</sup> Stevenson Memorial Lecture, University of Western Ontario, London, Ontario, Canada.
- December 1993** ․ Sir Jules Thorn Lecture, The Royal College of Anaesthetists and The Royal College of Physicians, at The Royal College of Surgeons, London, UK.

- January 1994** › First Roussel Uclaf Prize for work in the field of Cell Communication and Signalling (jointly with Dr. R. Furchgott and Dr. L. Ignarro), France.
- February 1994** › Boehringer Ingelheim Lecture, University of Mainz, Germany.
- March 1994** › The Clinical Endocrinology Trust Medal and Lecture, 13th Joint Meeting of the British Endocrine Societies, UK.
- April 1994** › The Seventy-Fifth Mellon Lecture, University of Pittsburgh, USA.
- April 1994** › The “Luis Sanchez-Medal Lecture Award”, XXV Congress of the International Society of Hematology, Mexico.
- May 1994** › The Earl King Lecture, Royal Postgraduate Medical School, London, UK.
- July 1994** › The Royal Medal, awarded by Her Majesty The Queen upon the recommendation of the Council of The Royal Society, UK.
- July 1994** › Harrington Lecture, University at Buffalo School of Medicine and Biomedical Sciences, USA.
- September 1994** › The ISFC Lecture, awarded by the International Society of Cardiology.
- September 1994** › Council for High Blood Pressure Research, Arthur C. Corcoran Memorial Lecture, American Heart Association, Chicago, USA.
- November, 1994** › XIII Fernandez-Cruz Memorial Lecture, Madrid, Spain.
- November, 1994** › The Peterhouse Lecture, Cambridge University, UK.
- December, 1994** › Federico II Prize, University of Naples, Italy.
- August, 1995** › Gold Medal for Scientific Merit awarded by the Ministry of Health of Ecuador, Ecuador.
- September, 1995** › 1995 CIBA Award for Hypertension Research, together with Dr. L. Ignarro, USA.
- March, 1995** › The Chilton Lecture, University of Texas Southwestern Medical Centre, Dallas, Texas, USA.



- April, 1995** > The Walter MacKenzie Visiting Professor Lecture, University of Alberta, Edmonton, Canada.
- December, 1995** > The Halliburton Lecture, King's College London, UK.
- September, 1996** > Osamu Hayaishi Lecture, Kyoto University, Japan.
- October, 1996** > The Fourth Annual Blythe Lecture, University of North Carolina School of Medicine, USA.
- October, 1996** > The Gregory Pincus Memorial Lecture, The Worcester Foundation for Biomedical Research, Massachusetts, USA.
- November, 1996** > The Graeme Bell Henderson Memorial Lecture, The Picower Institute, New York, USA.
- March, 1997** > Oliver Sharpey Lecture, Royal College of Physicians, London, UK.
- March, 1997** > University of Iowa College of Medicine Lecture, USA.
- April, 1997** > The Priestley Lecture, Royal Society of Chemistry, London, UK.
- May, 1997** > Leccion conmemorativa "Jimenez Diaz", Madrid, Spain
- May 1997** > Louis and Artur Lucian Award (jointly with Prof. R. Furchgott), McGill University, Montreal, Canada.
- June, 1997** > Ottorino Rossi Award, Italian Society for Neurogeriatrics, Varese, Italy.
- June 1997** > 2<sup>nd</sup> Robert Muir Lecture, University of Dundee, Scotland
- June, 1997** > X<sup>th</sup> Trabucchi Foundation Annual Lecture, Fondazione Emilio Trabucchi, Milan, Italy.
- February, 1998** > The National Institute of Health Director's WAL Lecture, Bethesda, USA.
- March 1998** > Sir Arthur Hurst Lecture, British Society of Gastroenterology, UK.
- April 1998** > The Jephcott Lecture, Royal Society of Medicine, UK.
- April 1998** > The Heberden Oration, British Society for Rheumatology, UK.
- May 1998** > The St. Cyres Lecture, British Cardiac Society, UK.

- June 1998** > The Rudolf Virchow Lecture, Julius-Maximilians-University, Würzburg, Germany.
- September 1998** > The Cummings Lecture, The Migraine Trust, London, UK.
- November 1998** > The Harry Boström Lecture, Congress of the Swedish Association for Medicine, Göteborg, Sweden.
- March 1999** > The Inaugural D. Harold Copp Lecture, The University of British Columbia, Vancouver, Canada.
- April 1999** > The Samuel Kuna Distinguished Lectureship in Toxicology, Rutgers University & The University of Medicine and Dentistry of New Jersey, USA.
- April 1999** > Distinguished Achievement in Biomedical Science Award, Oakland University, Rochester, Michigan, USA.
- April 1999** > The Carl F. Schmidt Honorary Lecture, University of Pennsylvania, Philadelphia, USA.
- April 1999** > The Galen Medal in Therapeutics, Awarded by the Worshipful Society of Apothecaries of London, UK.
- April 1999** > The Dale Medal, Awarded by the Society for Endocrinology, UK.
- October 1999** > The Miguel Servet Lecture, Congress of Spanish Society of Cardiology, Seville, Spain.
- October 1999** > The Gold Medal of the Spanish Society of Cardiology, Spain.
- November, 1999** > The William Dameshek Prize, awarded by The American Society of Hematology, USA.
- April, 2000** > The Bayliss-Starling Prize Lecture, awarded by The Physiological Society, UK.
- May, 2000** > The Linacre Lecture, St. John's College Cambridge, UK.
- July, 2000** > The Gold Medal of The Royal Society of Medicine, UK.
- May, 2001** > The Morton I Grossman Distinguished Lectureship, USA.
- May, 2001** > The Gilston Lecture, Intensive Care Society, Bournemouth, UK.

- August, 2001** › The Wallace O. Fenn Lecture, International Union of Physiological Sciences, Christchurch, New Zealand.
- September, 2001** › The Henry Barcroft Lecture, Queen's University Belfast, UK.
- October, 2002** › Le Grand Prix Annuel Lefoulon-Delalande, awarded by the Institut de France, France.
- September, 2002** › The 18<sup>th</sup> Annual Page Lecture, The Cleveland Clinic Foundation, USA.
- October, 2002** › 14<sup>th</sup> J.F. Heremans Memorial Lecture, Universite Catholique de Louvain, Belgium.
- November, 2002** › 2<sup>nd</sup> Annual Brenner Lecture, American Society of Nephrology, USA.
- May, 2003** › The Grande Covian Memorial Lecture, Spanish Society of Arteriosclerosis, Spain.
- November, 2003** › The Amedeo and Frances Herlitzka International Prize awarded by The Academy of Sciences of Turin, Italy.
- June, 2004** › Ordem Nacional do Mérito Científico na Classe a Grã-Cruz, Brasil.
- October, 2004** › The Lennox K. Black International Prize for Excellence in Medicine, awarded by Thomas Jefferson University, Philadelphia, USA.
- May, 2005** › The Croonian Lecture, The Royal Society, London, UK.
- April, 2006** › The Earl P. Benditt Award, awarded by North American Vascular Biology Organization, USA.
- April, 2006** › Feodor Lynen Lecture, The German Society for Biochemistry and Molecular Biology, 57th Mosbach Colloquium, Germany.
- April 2006** › The Mackenzie Medal, awarded by the British Cardiac Society, UK.
- November 2006** › The 49<sup>th</sup> Annual Lecturer at The David Geffen School of Medicine, University of California Los Angeles.

- March 2007** › Dart/NYU Biotechnology Achievement Award, The Biotechnology Study Center of New York University School of Medicine.
- September 2007** › Julio H. Garcia Memorial Lecture, Sociedad Iberoamericana de Enfermedad Cerebrovascular, Lima, Peru.
- November 2007** › The Peter Baker Lecture in Physiology, King's College London.
- January 2008** › The First Jens Chr. Skou Lecture, Aarhus University, Denmark.
- May 2008** › The Klassen Lecture, Ohio State University, Columbus, Ohio, USA.  
 › The Brockington Lecture, Queen's University, Kingston, Ontario Canada. › GRUM Prestigious Lecture, University of Montreal, Canada.
- May 2009** › Magna Lecture, Brazilian Academy of Sciences, Rio de Janeiro, Brasil.
- January 2010** › Awarded a Knighthood by Her Majesty the Queen in the New Year Honours list.
- November 2010** › The Christian J. Lambertsen Lecture, University of Pennsylvania, Philadelphia.  
 › The Charles E. Dohme Memorial Lecture, The Johns Hopkins University School of Medicine, Baltimore.
- June 2011** › The Chancellor's Award Lecture in Neuroscience, Louisiana State University Health Sciences Centre, New Orleans.
- September 2011** › The Bernard and Joan Marshall Distinguished Investigator Lecture, awarded by The British Society for Cardiovascular Research.
- October 2011** › Robert E. Beamish Award lecture for a leadership role in promoting cardiovascular sciences and education, Winnipeg Heart International Conference.

- December 2011** › Honorary Fellowship of the British Pharmacological Society.
- March 2012** › Harold Ackroyd Memorial Lecture, Gonville and Caius College Cambridge.
- June 2012** › Professor Fritz Bach Memorial Lecture, 7th International meeting on Heme oxygenase, Edinburgh.
- June 2012** › The Colter lecture, University of Alberta, Edmonton, Canada.
- June 2012** › The Paulette Shirey Pritchett lecture, University of Birmingham, Alabama, USA.
- October 2012** › The First Andres Laguna Lecture, Universidad de Alcala, Madrid, Spain.
- January 2013** › Ernst Jung-Medaille für Medizin in Gold, Jung-Stiftung für Wissenschaft und Forschung, Hamburg, Germany.

## Honorary Degrees

- January 1986** › The Degree of Doctor “Honoris Causa” of the Faculty of Medicine, Universidad Complutense de Madrid, Spain.
- October 1987** › The Degree of Doctor “Honoris Causa” of the Faculty of Medicine of the University of Honduras, Honduras.
- June 1988** › The Degree of Doctor “Honoris Causa” of the University of Cantabria, Spain.
- March 1989** › Academico de Honor, Real Academia de Medicina de Valencia, Spain.
- May 1993** › Academico de Honor de la Real Academia Nacional de Medicina, Madrid, Spain..
- July 1994** › Honorary Degree of Doctor of Science, University of Sussex, Brighton, UK.
- May 1995** › Honorary Degree of Doctor of Science, Mount Sinai School of Medicine, New York, USA.
- July 1995** › Honorary Degree of Doctor of Science, University of Nottingham, UK.

- February, 1997** › The Degree of Doctor “Honoris Causa” of the University Pierre & Marie Curie, Paris, France.
- May, 1997** › The Degree of Doctor “Honoris Causa” of Medicine, University of Antwerp, Belgium.
- June, 1997** › The Degree of Doctor “Honoris Causa” of Medicine and Surgery, University of Torino, Italy.
- November, 1997** › Doctor Honoris Causa of the University of El Salvador.
- November, 1997** › Doctor Honoris Causa of the Central University of Ecuador.
- October, 1999** › Doctor Honoris Causa of the University of Santiago de Compostela, Spain.
- March, 2000** › Doctor Honoris Causa of the Universite de Mons-Hainaut, Belgium.
- May, 2000** › Honorary Doctor of Medicine of the University of Tampere, Finland.
- July, 2000** › Honorary Degree of Doctor of Science of the University of Edinburgh, Scotland.
- December, 2000** › Doctor Honoris Causa of the University of Salamanca, Spain.
- July, 2001** › Honorary Degree of Doctor of Laws, University of Dundee, Scotland.
- June, 2002** › Doctor Honoris Causa of the University of Montréal, Canada.
- June 2003** › Doctor Honoris Causa, Universita “Roma Tre”, Rome, Italy.
- July, 2003** › Honorary Doctor of the Faculty of Medicine, Johann Wolfgang Goethe-Universität, Frankfurt am Main, Germany.
- April, 2006** › Doctor Honoris Causa, Université de Liège, Belgium.
- September, 2006** › Laurea Honoris Causa in Pharmacy, Università degli Studi di Urbino “Carlo Bo”, Italy.
- June 2007** › Lifetime Achievement Award, awarded by the International Association of Inflammation Societies.

- April 2008** › Doctor Honoris Causa, Charles University, Prague, Czech Republic.
- September 2008** › Doctor Honoris Causa, Aarhus University, Denmark.
- October 2013** › Profesor Invitado de la Universidad de La Habana, Cuba.
- October 2013** › Academico de Honor, University of Cantabria, Spain.
- November 2013** › Doctor Honoris Causa, Universidad de Buenos Aires, Argentina.

## Visiting Professorships

- 1988** › Visiting Professor Department of Pharmacology, King's College London.
- 1992** › Visiting Professor Department of Medicine, King's College School of Medicine & Dentistry, London.
- 1998** › Visiting Professor Department of Pharmacology, King's College London.
- 1998** › Honorary Professor in The Welsh School of Pharmacy, Cardiff University.

## Editorial work

- 1975-1980** › Section Editor (General Pharmacology) for the journal Prostaglandins.
- 1980** › Consulting Editor, Prostaglandins.
- 1980-85** › Member of the Editorial Board of the British Journal of Pharmacology.
- 1980** › Member of the Editorial Board of Atherosclerosis (Journal of the American Heart Association).
- 1980** › Member of the Editorial Committee of Archivos Venezolanos de Farmacologia y Terapeutica.
- 1986** › Member of the Editorial Board of the European Journal of Clinical Investigation.
- 1989** › Member of the Editorial Board of Thrombosis Research.

- 1989** › Member of the Editorial Board of *Clinica e Investigacion en Arteriosclerosis*.
- 2003** › Member of the Editorial Board of the Proceedings of the National Academy of Sciences, USA.

## Books

Scientific Editor of *The British Medical Bulletin*, no. 39, part 3, Prostacyclin, Thromboxane and Leukotrienes, 1983.

“Prostacyclin in Pregnancy” edited by P.J. Lewis, S. Moncada and J. O’Grady, published by Raven Press, New York, 1983.

Nitric oxide from L arginine: a bioregulatory system, edited by S. Moncada and E.A. Higgs, published by Elsevier, Amsterdam, 1990.

Clinical Relevance of Nitric Oxide in the Cardiovascular System, edited by S. Moncada, E.A. Higgs and J.R. Berrazueta, published by EDICOMPLET, S.A. Madrid, 1991.

The Biology of Nitric Oxide. Part 1: Physiological and Clinical Aspects. edited by S. Moncada, M.A. Marletta, J.B. Hibbs Jr. and E.A. Higgs, published by Portland Press Proceedings, London, 1992.

The Biology of Nitric Oxide. Part 2: Biochemistry, Enzymology and Immunology, edited by S. Moncada, M.A. Marletta, J.B. Hibbs Jr. and E.A. Higgs, 1992.



Nitric Oxide: Brain and Immune System, edited by S. Moncada, G. Nistico and E.A. Higgs, Portland Press, London, 1993.

The Biology of Nitric Oxide. Part 3: Physiological and Clinical Aspects, edited by S. Moncada, M. Feelisch, R. Busse and E.A. Higgs, Portland Press Proceedings, London, 1994.

The Biology of Nitric Oxide. Part 4: Enzymology, Biochemistry and Immunology, edited by S. Moncada, M. Feelisch, R. Busse and E.A. Higgs, Portland Press Proceedings, London, 1994.

The Biology of Nitric Oxide. Part 5. edited by S. Moncada, J. Stamler, S. Gross and E.A. Higgs, Portland Press Proceedings, London, 1996.

The Biology of Nitric Oxide. Part 6. edited by S. Moncada, N. Toda, H. Maeda and E.A. Higgs, Portland Press Proceedings, 1998.

Nitric oxide and the Cell: Proliferation, Differentiation and Death. Edited by S. Moncada, G. Nistico, G. Bagetta and E.A. Higgs, Portland Press, London, 1998.

The Biology of Nitric Oxide. Part 7. edited by S. Moncada, L.E. Gustafsson, N.P. Wiklund and E.A. Higgs, Portland Press Proceedings, 2000.

Nitric Oxide and the Peripheral Nervous System. Edited by N. Toda, S. Moncada, R. Furchgott and E.A. Higgs, Portland Press Ltd., London, 2000.

The Vascular Endothelium (Handbook of Experimental Pharmacology). Edited by S. Moncada and E.A. Higgs. Springer-Verlag Berlin. 2006.

## Inventorships

Patent no. 1 583 961

PROSTACYCLIN AND DERIVATIVES THEREOF

Patent no. 1 583 962

PROSTACYCLIN DERIVATIVES

Patent no. 1 601 034

PHARMACEUTICAL COMPOSITIONS

Patent no. 1595 056

PHARMACEUTICAL COMBINATION

Patent no. 2033745 B

UNSATURATED FATTY ACID FOR USE IN THROMBO-EMBOLIC  
DISEASE

PA1437

L-NMMA FOR PREVENTION OF TISSUE DAMAGE

PA1439

INDUCIBLE NO SYNTHASE

## Publications

1. Moncada, S. (1970). Characteristics of candidates for enrolment in the Medical School of the University of El Salvador. Doctoral Thesis.
2. Ferreira, S.H., Moncada, S. and Vane, J.R. (1971). Indomethacin and aspirin abolish prostaglandin release from the spleen. *Nature New Biol.*, 231, 237-239.
3. Ferreira, S.H. and Moncada, S. (1971). Inhibition of prostaglandin synthesis augments the effects of sympathetic nerve stimulation on the cat spleen. *Br. J. Pharmac.*, 43, 491P.
4. Moncada, S., Ferreira, S.H. and Vane, J.R. (1972). Does bradykinin cause pain through prostaglandin production? Abstracts of Volunteer Papers. V. Int. Congress Pharmacology, San Francisco, 160.
5. Ferreira, S.H., Moncada, S. and Vane, J.R. (1973). Some effects of inhibiting endogenous prostaglandin formation on the responses of the cat spleen. *Br. J. Pharmac.*, 47, 48-58.
6. Ferreira, S.H., Moncada, S. and Vane, J.R. (1973). Further experiments to establish that the analgesic action of aspirin like drugs depends on the inhibition of prostaglandin biosynthesis. *Br. J. Pharm.*, 47, 629P, 1973.
7. Ferreira, S.H., Moncada, S. and Vane, J.R. (1973). Prostaglandins and the mechanism of analgesia produced by aspirin like drugs. *Br. J. Pharmac.*, 49, 86-97.
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9. Moncada, S., Ferreira, S.H. and Vane, J.R. (1973). Inhibition of prostaglandin biosynthesis and its effect on sympathetic neurotransmission in the cat isolated spleen. Proc. Second Meeting on Adrenergic Mechanisms. Porto, 51 52.
10. Ferreira, S.H., Moncada, S. and Vane, J.R. (1974). Potentiation by prostaglandins of the nociceptive activity of bradykinin in the dog knee joint. Br. J. Pharmac., 50, 461P.
11. Ferreira, S.H., Moncada, S. and Vane, J.R. (1974). The blockade of the local generation of prostaglandins explains the analgesic action of aspirin. Agents and Actions 3/5, 385 386.
12. Moncada, S., Ferreira, S.H. and Vane, J.R. (1974). The blockade of local generation of prostaglandins explains the analgesic action of aspirin. Polish J. Pharmac. Pharm., 6, 77.
13. Ferreira, S.H., Moncada, S. and Vane, J.R. (1974). Prostaglandins and the signs and symptoms of inflammation. Prostaglandin Synthetase Inhibitors, eds. H.J. Robinson and J.R. Vane, Raven Press, New York, 175 187.
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16. Ferreira, S.H., Moncada, S., Parsons, M. and Vane, J.R. (1974). The concomitant release of bradykinin and prostaglandin in the inflammatory response to carrageenin. Br. J. Pharmac., 52, 108 109P.

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of prostacyclin (PGI<sub>2</sub>) on the cardiovascular system and the gastric microcirculation. *Acta Biol. Med. Germ.*, 37, 725-728.

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