Copyright Notice

<u>Mathematics Inc., a private letter from its Chairman.</u>

Dear ... ,

Yes, indeed, it has been a hectic year! Thank you for your kind feelings.
As a matter of fact it started already around Xmas last year, when the rumour
reached us that the International Research Development Corporation IRDC was
trying to penetrate our market! IRDC is represented by Obfuscate et al., that
old clannish sollicitors firm in Oldcaste-upon-Time, which --as luck would
have it!-- employs a former classmate of mine. I wrote him a letter --full
of sugar, you may be sure!-- as if I were appealing to him for legal advice.
It all worked our beautifully, he even did send us a draft contract, thus
providing us with all the information we wanted to have! It was all most
reassuring: IRDC is so firmly entangled in legal complications that they are
no longer a serious threat. Our monopoly is safe -- and in case of problems:
we have arranged a secret affair between the nightporter of the Hosanna
Building and the second daughter from old Obfuscate's first marriage, so
blackmail is always there as emergency exit.

The whole affair had one nasty consequence: in our moment of panic we
felt that we had to <u>do</u> something, and our Proof of the Riemann Hypothesis has
been brought out into the field, contrary to the advice of our marketing
manager who felt that it still required too much maintenance. And right he
was: we can --and do!-- burn our stove with the incoming trouble reports!
End of March we have transferred fifty mathematicians from Production to
Field Support, thus solving two problems at once.

Business being what it was, something had to be done about production,
for our stock of unsold theorems was growing beyond the acceptable limits.
I have always argued that we should have a reasonable amount of spare theorems
in stock, but in March they already occupied nearly two full floors of the
Hosanna Building! Besides the transfer of the fifty mathematicians --we have,
of course selected the fifty most productive ones-- we have returned to our
old method of productivity measuring: since February 1974 we measured mathe-
matician productivity by the number of new results obtained per month; we are
now back on the more realistic and, after all, also more objective technique
of counting the number of lines of proof produced per week. Thanks to those
two measures, the stack of unsold theorems, I am happy to say, is slowly
shrinking back to normal size.

But for a few little, specialized firms (one in finite geometry and
another one in combinatorial logic), Mathematics Inc. has now full control
of the mathematical market, a circumstance that is certain to create both
political and economic problems. It is not yet an open battle, but the first
symptoms of revolt against our dominance become visible for the discerning
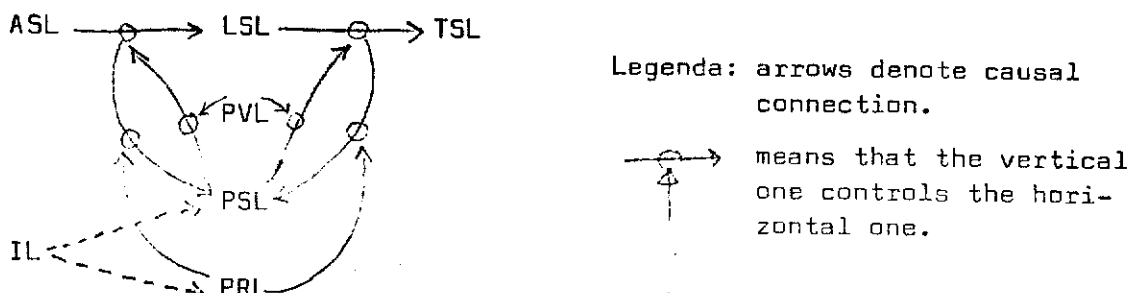eye.

For the time being we have nothing to fear, for our greatest allies
are and remain the universities, their departments of mathematics, I mean.
They should fight us to death, because the more we proceed, the more obso-
lete they become, and in the end they will be abolished as superfluous. But
the technique is so simple! One just sponsors a conference that one calls a
"symposium" with only invited university professors as participants. One
chooses a nice subject like "The Impact of Mathematics on Society in the
Eighties" or "The Role of Mathematical Education in Preparing for the Future"
or any other nil-topic. They are so flattered, they come in as an eager flock,
proudly carrying their badges home when it is all over. It is pathetic! But

also absolutely effective! Did you know that our Differentiation Kit is now
used at 378 universities, all over the world? All their alumni will have
to subscribe to our "Journal of Kit Differentiation" for the rest of their
lives, if they want to remain up to date. The whole movement has now such
an impetus that it proceeds without us pushing it anymore; the French have
already founded a separate Society for Theoretical Kit Differentiation. It
is the same story with our Linear Algebra Kit, our Integration Kit, and our
Statistics Kit. It fully absorbs and paralyzes them, leaving the field open
for us. Our only obligation is to modify the Kits regularly, that is, to
change their appearance slightly, just enough to suggest progress. And really,
the universities love them: they always fall for the newest model! They feel
themselves superios to the other backward universities and colleges that have
not yet converted to Kit Mathematics.

You know that the overall economic, political, and social aspects of
this whole venture interest me more than the purely technical issues. But
the latter are intriguing too! As soon as Mathematics Inc. grew beyond one
hundred employees --can you remember how long ago that was? it seems ages...--
it was clear that, no matter what we would tackle, the diversity of our pro-
ducts and manufacturing techniques would create havoc from the organizational
point of view. As standardization of products is only possible to a very
limited extent --the market place somehow insists on variety-- we had to
standardize our manufacturing techniques. And we are proud of our IR System
for Integrated Reasoning, and I think justly so. In the beginning the IR
System was not too successful, because we needed a computer and chose the
then fashionable 1033-alpha, a machine for which the MTBF transpired to be
of the order of magnitude of twenty minutes. The IR Systems works much better
since we have replaced it by the new model 1033-omega, for which via a switch
on the console the parity check can be disabled. As soon as we had the new
machine, IR made significant progress: the whole IR System now consists of
the following languages:

ASL   Axiom Statement Language
LSL   Lemma Statement Language
TSL   Theorem Statement Language
PSL   Proof Statement Language
PVL   Proof Verification Language
PRL   Proof Refuting Language (our main debuggin aid)
IL   Inference Language.

Their mutual relation is roughly as follows

ASL ——o——> LSL ——o——> TSL

Legenda: arrows denote causal
         connection.

——o——>   means that the vertical
         one controls the hori-
         zontal one.

Actually this is a slight simplification, because it refers only to the
high-level languages PVL, PSL, and PRL, while we have the corresponding
low-level languages pvl, psl, and prl as well: they are only needed when
the IR-facilities need more efficient exploitation.

As you see immediately from the above diagram, ASL, LSL and TSL are
purely syntactic languages without any semantic contents, PSL is a language

with an ambiguous, nondeterministic syntax and only first-order semantics, while only PVL and PRL have second-order semantics. IL --although we call it Inference Language for the sake of homogeneity-- is, of course, no language at all: it is no more than the specification of the interpretation that can supply quasi-semantics for ASL, LSL, and TSL.

It is amazing that people have never thought about the coupling of reasoning controlling activities, but once you have got the idea, it is clear that the above scheme provides all the facilities you may ever need. Our IR System --which, of course, is for internal use only-- has been very successful. (I have heard rumours that the application of PRL to Riemann Proof will require a 1033-omega-super, extended with a quadruple-length complex arithmetic unit. Some guys are so fanatic that they want to order one, but --thank goodness!-- I hold the purse strings, and I think that I can convince them that also in this case we had better stick to the company policy --which, after all, has always been very successful-- of leaving the last stage of quality control to those rare customers that think that they really need that extra quality.)

Needless to say, I consider the main benefits of the IR System to be psychological and sociological: the presence of the tool has effectuated more homogeneity in the company than regulations could ever have achieved. There was a time that our topologists could not communicate with the number theorists, they lived in different worlds, although they could work on the same floor! But the IR System provides a standard, common universe of discourse, and, again they understand each other. You can believe me or not, but the other day I saw one guy of the Riemann Group and another guy from the Four Colour Project exchange a few IL-cards! I cannot describe to you how happy that observation made me: at that moment I knew that I had founded a living company. Semper floreat et crescat!

Yours ever,

Edsger W.Dijkstra, Chairman
Mathematics Inc.
Hosanna Building

PS. Secret! We are, of course, constantly trying to protect our company against the possible consequences of changing attitudes, and we are not blind to the current anti-intellectualistic undercurrents in our society that rouse popular feeling against Reason. We keenly observe the semi-mystic "back-to-nature" movements that want to do away with organization, with power, with shaving, bra's and socks. They provide an alibi for the second rate college teacher preaching that "truth is dehumanized if it has to be proved" and "true truth is what one feels to be true" etc. In view of this quasi-religious revival, our third Assistant Vice-President is contemplating --I think that that is the right word for it-- an Artifical Devotion Department. (Maybe it is only because his wife presently spends a lot of her time "reviving". Before the AD Department has materialized, she may have lost interest in revivals or he in her....) In the preparatory stage he has designed Canonical Forms for the Seven Capital Sins, and you should see them: they are absolute beauties! It looks very promising, and this could turn into a very interesting daughter of the company. (End of Secret.)

Your Ref: EWD 475   29th February 1975.

Dear Edsger,

I was delighted to hear from you after all these years.
My apologies for the delay in replying to your letter, but as you will see, it
had to be forwarded to my new address.

It was indeed fortunate that you should seek my advice,
since my firm represents the International Research Development Corporation.
The IRDC is a well-established non-profit-sharing corporation which seeks to
assist creative institutions and individuals to obtain real rewards for their
abstract labours. Amongst their clients have been L.D.Vinci, N.Bourbaki, D.Scott,
the Department of Machine Intelligence of the University of Edinburgh and the
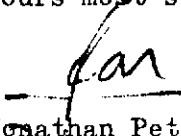publishers of the Vienna Telephone Directory, to name but six.

To my surprise, it would appear from your letter that
Mathematics Inc. has not established a legal department capable of overseeing
the protection and exploitation of its creations, and I would therefore suggest
that you join forces with IRDC. Contrary to your supposition, recent changes in
patent law have enabled Mathematicians to obtain legal protection for their
Theorems. IRDC are perhaps the first organisation to take full advantage of this
new situation. They have, in conjunction with my firm, started offering their
services to Mathematics-based industrial concerns such as yours, and on occasion
to individual Mathematicians, although the day of the individual Mathematician
is I fear drawing to a close.

I enclose for your information a draft form of the revenue
sharing agreement that IRDC would wish you to accept. You will I believe find the
provisions most reasonable, although I am afraid they cannot undertake any aspect
of the task of theorem maintenance.

Incidentally, although, as you say, it will be necessary
at some stage for you to disclose the Proof of your Theorem, it has become the
fashion to do this by providing what is called an Implementation, which can be
given in such excruciating detail that you need have no fear that your competitors
would find it more profitable to understand the proof than to sign a Royalty
Agreement. Thus, our last patent, for one of the gentlemen named above, contained
no fewer than 2973 lemmas, and was based on a novel extension, to three dimensions,
of Petri-Net Theory.

I look forward to hearing from you and to joining you
for dinner at the Bali. My secretary's assistant will make the detailed arrange-
ments by telephone.

Yours most sincerely,

Jonathan Pettifogger.

E.W.Dijkstra,
Chairman,
Mathematics Inc.
Hosanna Buildings,
Plataanstraat 3
NUENEN
The Netherlands

REVENUE SHARING AGREEMENT:

T H I S A G R E E M E N T is made the
day of   One thousand nine hundred and seventy-
five B E T W E E N EDSGER WYBE DIJKSTRA of plataanstraat 5
Nuenen (hereinafter called "the Mathematician" which expression
shall include his legal personal representative) of the first part
MATHEMATICS INC. (hereinafter called "the Institution") of the
second part and The INTERNATIONAL RESEARCH DEVELOPMENT CORPORATION
(hereinafter called"the Corporation") of the third part

W H E R E A S by an Assignment of even date herewith
and made between the parties hereto the Mathematician and the
Institution assigned to the Corporation the full benefit of the
theorems and relative Applications for Letters Patent particulars
of which are set out in the Schedule hereto and it nas been agreed
that the Corporation shall endeavour to secure the exploitation of
the said theorems upon the terms hereinafter contained

NOW IT IS HEREBY AGREED by and between the parties hereto
as follows:-

1.   SUBJECT as hereinafter provided the Corporation shall
   use all reasonable endeavours having regard to the circumstances
prevailing from time to time to secure the exploitation of the said
theorems in such manner (including the sale thereof) and upon such
terms as it shall in its sole discretion deem fit

2.   SO far as their commitments allow the Mathematician
and the Institution shall from time to time upon request by the
Corporation furnish the Corporation with any drawings models designs
lemmas technical data information (including computer programs and
manuals if any herein called Works) or "know-how" in their possession
relating to the said theorems and the Mathematician shall make available
to the Corporation or as the Corporation may reasonably require any
consultancy services which may be necessary to further the exploi-
tation of the said theorems.

3.   (1) THE Corporation shall keep accounts showing:-

            (A) gross receipts of the Corporation (as herein-
            after defined)

            (B) costs fees and expenses of the Corporation
            (whether external or internal) in connection with
            this Agreement in respect of the following:

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(i)   the filing and prosecution of Patent
Applications and the procurement and maintenance
of Letters Patent or like protection

(ii)   proceedings before the Patent Office or
any appeal tribunal therefrom in any country

(iii)   professional advice on patent matters
relating to the said theorems or otherwise
incidental to the implementation of this
Agreement

(iv)   proceedings by or against the Corporation
in any Court or Tribunal in any country for the
enforcement or defense of any Letters Patent to
which this Agreement applies or for revocation
of or opposition to any Letters Patent or Applic-
action therefor of any third party or for any other
cause (including any costs or sums awarded against
the Corporation in any such proceedings)

(v)   the preparation and stamping of legal
documents

(vi)   agents' commission

(C) payments (if any) made by the Corporation to the
Mathematician and the Institution in reimbursement of
expenses incurred in applying for Letters Patent in
respect of the said theorems or for any items or
services provided by the Inventors or the Institution
under the provisions of Clause 2 hereof

(D) travelling and out-of-pocket expenses and other
direct expenditure incurred by the Corporation in
furtherance of its obligations under this Agreement

(2)   AS soon as possible after the last day of December
in each year commencing with the last day of December One thousand
nine hundred and seventy-five the Corporation shall render to the
Institution a cumulative statement showing the receipts and expenditure
of the Corporation for the preceding year (or any period longer than
a year or any proportion thereof) under the headings in sub-clause
(1) of this Clause and the Institution shall render to the Corporation
at the same time a statement of any expenditure of the Institution and
the Mathematician for the same period which it may have been agreed by
the Corporation shall be amortised as hereinafter provided

(3)   THE gross receipts shall be absolute property of
the Corporation but the Corporation shall pay to the Institution
annually such sum as shall(when aggregated with previous payments)
amount to the greater for the time being of:-

(I)   five per centum (5%) of the cumulative gross receipts

or

(II)   fifty per centum (50%) of the net amount for the time being remaining after amortization out of the cumulative gross receipts of the aggregate of:-

(i)   the costs fees payments and expenses of the Corporation referred to in paragraphs (B) (C) and (D) of sub-clause (1) of this clause and

(ii)   any expenses of the Institution and the Mathematician which it may have been agreed by th Corporation shall be amortized out of the gross receipts

(4) THE costs fees payments and expenses referred to in sub-clause (3)(II) of this Clause shall be amortized in proportion to the respective amounts arising under sub-paragraphs (i) and (ii) thereof and the amount of the expenses of the Institution and the Mathematician so amortized shall be paid to the Institution from time to time as provided in sub-clause (8) of this Clause

(5) THE receipt of the Institution shall be a good discharge to the Corporation for any payments to be made by the Corporation under the provisions of this Clause

(6) THE expression "gross receipts" as used in this Clause shall mean the actual royalties or other sums received from time to time by the Corporation in respect of the exploitation of the said theorems(including the amount of any damages awarded to the Corporation in any infringement proceedings) or of any drawings models designs lemmas technical data information or know-how furnished to the Corporation pursuant to Clause 2 hereof but excluding any sums received by the Corporation in respect of or relative to the recovery of expenditure incurred by the Corporation in the development of the said theorems There shall be added to such gross receipts the amount of any income tax deducted therefrom before receipt

(7) WHERE the said theorems are exploited in conjunction with other theorems and patent rights owned by the Corporation in such manner that the Corporation receives royalties or other sums in respect of all such theorems and patent rights without distinction as to the amount deriving from each such theorem the gross receipts attributable to the said theorems shall be as determined by the Corporation

(8) PAYMENTS by the Corporation pursuant to sub-clause (3) and (4) of this Clause shall be made annually on or before the last day of March in each year

(9) EACH of the parties hereto shall (on request) produce to any duly authorised representative of the other parties for inspection the accounts of its receipts and expenses referred to in this Clause and any receipts or vouchers relating thereto

(10) NOTHING in this Agreement contained shall be construed as requiring the Corporation to develop and maintain or to assist or procure the development and maintenance of the said theorems nor as precluding the Corporation from developing and maintaining or assisting or procuring the development and maintenance thereof on such terms as it may in its sole discretion deem fit But no expenditure incurred on such development and maintenance and no sums recovered in respect thereof or relative thereto shall be included in the accounts referred to in this Clause

4. (1) BEFORE abandoning any Application or witholding payment of any fee necessary for procuring or keeping in force any Letters Patent (which expression shall include any like form of protection) to which this Agreement applies the Corporation shall use all reasonable endeavours to give to the Institution adequate notice of its intended course of action and for the period of three months thereafter(if so required by the Institution and if and so far as practicable) to procure the continuance of the prosecution of the Application or the grant or maintenance of the Letters Patent PROVIDED THAT the Institution shall pay or indemnify the Corporation against all costs and expenses incurred in such period in so doing

(2) EXCEPT in regard to any Application and Letters Patent referred to in sub-clause (1) hereof which the parties may agree shall continue to be prosecuted or maintained by the Corporation after the period therein referred to (whether at the expense of the Institution or otherwise) the Institution shall have the right at any time within three months after the receipt of notice under such sub-clause to the re-assignment of the Applications and Letters Patent therein mentioned which are still subsisting upon payment by the Institution to the Corporation of the costs of such assignment and of the expenditure of the Corporation in respect of the Applications and Letters Patent so assigned and certified by the Corporation's Accountant as not having been amortized under sub-clause (4) of Clause 3 hereof

(3) ANY assignment of any Applications or Letters Patent to the Institution under the provisions of sub-clause (2) of this Clause shall be subject to the provisions of any Agreements or other arrangements which the Corporation shall previously have entered into relating thereto and unless all Applications and Letters Patent to which this agreement for the time being applies are so assigned there shall be reserved or granted to the Corporation under the Letters Patent and Applications so assigned the irrevocable right to make use and sell without payment of royalty and to grant sub-licence for such purposes

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(4) . EXCEPT as hereinbefore provided the Corporation shall not be liable to prosecute any Application or to procure or maintain in force any letters Patent to which this Agreement applies

5.   THE Mathematician and the Institution shall not at any time oppose the grant of or dispute the validity of any Letters Patent or like protection to which this Agreement applies or any of the claims thereof or assist or advise any person so to do

6.   THE Corporation shall not be under any obligation to institute or defend any legal proceedings whether for infringement or otherwise in respect of any Application or any Letters Patent or like protection to which this Agreement applies

7.   NOTHING herein contained shall be deemed to constitute partnership between the parties hereto or to constitute the Corporation as the Agent of the Institution or the Mathematician

8.   THE Institution and the Mathematician shall not nor shall any of them assign this Agreement or any of their rights benefits liabilities or obligations thereunder except with the previous consent of the Corporation

9.   THE Mathematician and the Institution shall:-

(A)   consult with the Corporation (so far as they are free to do so) as to the desirability of applying for Letters Patent in respect of the results of any further research or as to exploitation of any t - . program produced by them (or any of them) relating to the said theorems in reasonable time before making such results or any part thereof available for publication or commercial use

(B)   keep the Corporation informed from time to time of the results of any such further research as aforesaid (so far as they are free to do so)

(C)   keep the Corporation informed of any commitments or arrangements entered into or undertaken by them (or any of them) which restrict or prevent the fulfilment of this Clause and Clause 2 of this Agreement

10.   (1)   IN this Agreement the expression "the said theorems" shall wherever the context permits include all patent rights (being Letters Patent or like protection and Applications therefor in any parts of the world) in respect of the said theorems and shall (whenever appropriate) be deemed also to include any further theorems and patent rights which by agreement between the parties hereto are assigned to the Corporation for exploitation on the terms of this Agreement

(2)   IN so far as the Institution or the Mathematician or any of them may control or write future Works particularly adapted for use with or relating to the said theorems the Institution and Mathematician will consult with the Corporation as to the assignment of all rights in the future works to the Corporation for exploitation upon the terms hereof (the copyrights being included in the term patent rights and Works in the term Theorem) all before any part thereof is made available to others save only a supply for usage for a non commercial purpose by a user under contract (in a form approved by the Corporation) to maintain the Works confidential

10   (3)   ANY such assignment agreed shall include undertakings
to supply copy of the Works to the Corporation and to keep the Works
confidential

11.   ANY notice consent or other communication authorised
or required to be given hereunder or for the purpose hereof shall
be deemed to be duly given by the Corporation if left at or sent by
recorded delivery post to the Institution at its principle address
or to the Mathematician at his last known address and in the case of
a notice given to the Corporation if left at or sent by recorded
delivery post to the principle office of the Corporation

12   ANY dispute question or difference arising under this
Agreement as to the rights or duties of any of the parties or the
construction or effect of any of the provisions of this Agreement
shall be referred to an Arbitrator to be agreed between the parties
and in default of agreement to be nominated by the President for the
time being of The Law Society and such reference shall be deemed to
be an arbitration agreement within the meaning of the Arbitration Act
1950 or any re-enactment or modification thereof for the time being
in force

            IN WITNESS whereof the Mathematician has
hereunto set his hand and seal and the Institution and the
Corporation have caused their Common Seals to be hereunto affixed
the day and year first above written

            THE SCHEDULE above referred to

Application No.	DATE	Title of Theorem	Mathematician.
16766/75	9 February 1975	Riemann Theorem	E.W.Dijkstra

SIGNED SEALED and DELIVERED   )
by the above named EDSGER WYBE   )
DIJKSTRA in the presence of:-   )

THE COMMON SEAL of MATHEMATICS   )
Inc. was hereunto affixed in the   )
presence of:-   )

The COMMON SEAL OF THE INTER-   ·)
NATIONAL RESEARCH DEVELOPMENT   )
CORPORATION was hereunto affixed   )
and authenticated by:-   )

            Authorised by the Corporation

            Secretary

I

"NRDC put up hard cash *theorem* before the project was finally proved?"

THE UNIVERSITY OF NEWCASTLE UPON TYNE

WITH THE COMPLIMENTS OF

Professor B. Randell

Jonathan.

Computing Laboratory
Claremont Tower   Claremont Road   Newcastle upon Tyne NE1 7RU.

NRDC was created to _____

NRDC paid half the cost, took half the risk and asked for no return on its money until the first motors were sold, leaving the Company free to carry out the work in its own way, without interference or the burden of interest charges.

NRDC could do the same, and more, for your Company project. Created to finance new technological ideas, it is staffed by people who are technically very well informed, free enough to be fast moving and always readily available.

What share of the cost NRDC bears is largely up to you. All NRDC

George Chuchla (*right*) of Elremco Limited, and Sales Manager Peter Corlett, discuss their D78 synchronous motors — developed in a three year programme backed by NRDC and already opening up an export market of multi-million pound potential.

is interested in is the technical and commercial potential of the project.

Contact Brian Mann at the National Research Development Corporation, Kingsgate House, 66-74 Victoria St., London SW1E 6SL. Or ring him on: 01-828 3400.

NRDC