

## SCIENTIFIC CORRESPONDENCE OF PROFESSOR DRAGOŠ CVETKOVIĆ

Professor Dragoš Cvetković has saved and classified a part of his scientific correspondence. These archives are located in the Mathematical Institute of the Serbian Academy of Sciences and Arts, Belgrade, Kneza Mihaila, 36. A part of the correspondence has been scanned and organized within several files whose names indicate the content and the period of time.

Each archive file is commented by D. Cvetković. Comments include some autobiographic facts which help in understanding the meaning of documents in the file. More details on the biography of D. Cvetković can be found in the book

Cvetković D., *Graphs as inspiration, Autobiographical Notes and Other Texts on the Occasion of Four Decades of Scientific Work in Mathematics (Serbian)*, Ed. V. Kovačević-Vujčić, Akademska misao, Beograd, 2006.

### **File: GENERAL CORRESPONDENCE, 1970 - 1974**

#### **Comments by D. Cvetković**

In 1960's I was a teaching assistant for mathematics at the Faculty of Electrical Engineering, University of Belgrade. By some chance I came across at problems concerning graph eigenvalues and started publishing some papers in 1969.

On July 21 1970 Professor Horst Sachs, Technische Hochschule Ilmenau, Ilmenau, German Democratic Republic, wrote a letter to Professor Dragoslav Mitrinović, Head of Mathematics Chair at the Faculty of Electrical Engineering, concerning my doctoral thesis. The Serbian translation of this letter is included here. In front of Sachs' letter a sketch of my thesis is included (Theme proposed for doctorate thesis).

I defended my doctoral thesis *Graphs and Their Spectra* on May 27, 1971.

On July 31 1972, American mathematician Richard Bellman sent me a letter in which he suggested that my doctoral thesis could be extended to a book to be published with Academic Press. Some exchange of letters occurred later that year (29.8, 5.10, 12.10).

In 1972 I got in touch with Michael Doob, University of Manitoba, Winnipeg, Canada, who also was dealing with graph spectra. In 1973 M. Doob visited Belgrade. Soon Professor H. Sachs and I invited M. Doob to join us

in writing the book "Spectra of Graphs". P. Erdős, F. Harary and H. Sachs visited Belgrade in 1974. I was in touch with many other mathematicians from abroad.

A "Középiskolai Matematikai Lapok" Szerkesztősegenek

Budapest

V. Szalai utca 10/VI

A belgrádi Elektrotechnikai Egyetem Matematikai Tanszékének munkatársai dolgoznak egy középiskolai matematikai versenyekről összegyűjtött példák kiadásán. A magyarországi középiskolai matematikai versenyekről is szeretnék idezni példákat. Az irodalom rendszeresítése és kibővítése céljából kérjük a "Matematikai Lapok" szerkesztőseget, hogy ha lehet, küldje el a "Középiskolai Matematikai Lapoknak" azokat a számaikat, amelyekben megvannak az 1962-es és 1964-es "Kurschak" olimpiasz, valamint az 1964-es "Arany Dani-el" olimpiasz II fordulójának példái az idősebb és fiatalabb tanulók részére.

Előre is köszönjük szíveségüket.

Fogadják baráti üdvözetünket.

Beograd, 1965 szeptember 17.-én.

A Matematikai Tanszék nevében:  
Cvetkovic Dragos, tanársegéd.

Címünk:

Elektrotechnicki fakultet, Katedra za matematiku,

Beograd, Bulevar Revolucije 73

Középiskolai matematikai  
 elektrotechnikai fakultet  
É e o g r a d  
 Sulever Revolucija 73.

Kedves Kollégák!

Köszönjük, el legyetek tesztek szeptember 17-i levelekben nyilvánított kérésüknek, már amennyire tudok. Mai postával küldöm 1955. évi I-3. számunkat, ezekben jelent meg az Arany János-Verseny II. fordulójának anyaga és az 1964-es Kürschák-Verseny anyaga.

Legye nek töltes ki a 1963/3-4. számú kötet, amiben az 1962-es Kürschák-Verseny feladatainak megoldásai jelentek meg. Az új anyagban nagyra szám volt, bár az kellett volna közzé, azt már már a régi anyag készítése, sem az új, jelenlegi. A kért anyagok is csatolva voltak, ezért a szerkesztői példányok, közzé írt!

Bárhol ajánlom, ha a Kürschák-Verseny feladatai között is a versenyben is érdeklődnek: rendeljék meg a teljes gyűjteményt. Új kiadásban kevés anyag jelent meg, az az 1963-as verseny is megvan benne. A könyvészeti adatai:

Fajó--Madács--Sarányi: Matematikai Verseny feladatok I. és II. kötet (1929-1963. évi versenyek), Tankönyvkiadó, Budapest 1964. 133, illetve 161 lap, ár 12,50 Ft, ill. 13,50 Ft. (Az I. kötet 1. kiadását még még Kürschák készítette 1929-ben, az angol fordítása is megjelent, talán 2 éve.)

Léha-néha eljut hozzám a zágrábi "Mat-Fiz-List", érdeklődéssel olvasom, és az illetékesek, szívből-szíve üdvözlöm a szerkesztőt a levelet. Örömmel olvasom, hogy közül Önknél versenyfeladatgyűjtemény, szeretném majd megszerezni, amikor megjelenik.

Ugyúgykérdésre mindenkor kézen barátságos üdvözlömet küldöm és sikert kívánok munkájukhoz.



*Handwritten signature:*  
 /László Tibor/  
 felelős szerkesztő

23. 4. 1965 [Signature]

PONEDELJAK

MART

1

Srednjoslovenski list

Dragi kolegi,

Ukoliko vam je bilo važno da vam se  
 pisano odgovori: So domovinske  
 prave knjige br. 1-5 u koji su  
 se objavljene misterijalno kazene  
 i za 1964. Rinde konstitucije  
 (Kas mi je slo ne mogu po-  
 slati broj 3-4 do 63 god. u koji-  
 mo se objavljeno do 62 (konstitucije  
 Rinde) jer mi ne mogu poslati.  
 Ovo dos interesuje zadaci Rinde  
 narod, formate naša prava  
 zbirka. U novom izdanju izšlo  
 je prvotno leto i obuhvata 63.  
 Prave: Hajos - Neukoune - Su-  
 ranyi - Moten. zadaci do tra-  
 miteji I i II deo (1894 - 1928 i dr.  
 1929 - 1963) Tanko nyukiado, B.  
 (str. 133, 161 / ceno 12,5 adm. B, S For.  
 / Izšlo je engl. izdanje pre  
 dve godine str. mislim)

Pozdrav iz moje strane. S  
 mol. - list. S interesovanj.  
 cilom koje s mnogim ročuneh  
 od reči do reči. Pravi i reči  
 Raduje me do se i kad vas  
 sprema knjiga o konstitucijama  
 i vpleo bi da je volim kad  
 izđe.

Lo zoro

GLASNIK MATEMATIČKI  
Zagreb - P.p.314

Br.16/70

Zagreb, 27. januara 1970.

47

Dragoš L. Ovetković  
Elektrotehnički fakultet  
B e o g r a d

Želimo Vas samo obavijestiti da smo Vaš članak "Die Zahl der Wege eines Graphen" u redu primili. Prosljedili smo ga recenzentu, te ćemo Vas izvjestiti čim nam stigne njegovo mišljenje.

S drugarskim pozdravom

Glavni urednik:



Dr Sibe Mardešić

*Zp 1706 Yfe W 10/11*

NOVO IZDAVANJE "MAT. MATEMATIKA I DEO"

Za juli mesec trebalo bi da bude pripremljeno za štampu novo izdanje ove knjige.

Molimo vas da vaše eventualne predloge o izmenama i dopunama date pismeno najdalje u toku aprila. Predlozi treba da ukažu na eventualne štamparske i stvarne greške kao i na to kojima bi zadacima trebalo izostaviti rešenje, a kojima dodati, i u ovom poslednjem slučaju dati rešenje.

Najbolje je sve predloge dati u obliku koji će biti podesan da se bez teškoća ubaci u rukopis za štampu.

Svi prihvaćeni materijali za štampu biće honorisani.

Ovo isto važi i za Matematiku II s tim što bi primedbe za njih trebalo predati septembra meseca ove godine.

D.S. Mitrović

*Mitrović*

5.3.70

Dragoř Cvetković  
Lamartinova 44  
Beograd, Yugoslavia

MR. HUDSON KRONK  
University of Binghamton  
NEW YORK, USA

17th July 1970

Dear Sir,

Please find enclosed the reprints of the papers which you requested. Please, at the same time, accept my apology for the delay in despatching the same.

Thanking you for your interest, I remain,

Sincerely Yours

Dragoř Cvetković



1970

THEME PROPOSED FOR THE DOCTORATE THESIS

GRAPHS AND THEIR SPECTRUMS

1. General

This theme is primarily related to finite, undirected graphs without loops and multiple edges. The adjacency matrix of graph, whose vertices are  $x_1, \dots, x_n$ , is matrix  $A = \| a_{ij} \|_1^n$ , where  $a_{ij} = 1$  if  $x_i$  and  $x_j$  are adjacent vertices while  $a_{ij} = 0$  in the opposite case. The spectrum of the <sup>graph</sup> path is the set of all the eigenvalues of the matrix A.

The basic purpose of the proposed theme is research of connectedness between the structural and spectral properties of graphs. More precisely this theme will be developed in the following two complementary directions:

- a. How several properties of the graphs are reflected in the spectrum of graphs?
- b. Which properties of the graphs and in which way can they be determined by spectrum of graph?

It is well known that a graph cannot be fully characterized by its spectrum. However, the spectral method can be efficient in a large number of problems.

It seems that the first paper dealing with the spectrums of graph is [9]. Afterwards, nearly a hundred of papers on this matter were published.

It was shown on a concrete example already in [9], that a graph is not determined by its spectrum. Other examples of nonisomorphic izospectral graphs ( [10], [11], [12] ) are also mentioned in literature.

It was shown in [13], that not only the characteristical polynomial of the adjacency matrix of graph but even the more general matrix functions do not determine the graph up to the isomorphism. In [13] are also given necessary and sufficient conditions which graphs must satisfy in order to have the same spectrums. Similar results may be found in the papers [11], [14], [15].

## 2. Survey of my results related to the theme and other authors' similar results

My results can be partitioned into four groups: 2.1. Determination of the spectrum of some graphs, 2.2. Bipartity, self-complementarity and connectivity and the spectrum of a graph, 2.3. Determination of the number of paths in a graph, 2.4. Graph products.

### 2.1. Determination of the spectrum of some graphs

The concept of normal summands is introduced in [2]. The normal summand is the matrix  $A_1 \otimes \dots \otimes A_n$ , where  $A_1, \dots, A_n$  are square matrices and  $\otimes$  denotes Kroncker's multiplication of matrices. Normal summand is also each matrix, obtainable from  $A_2 \otimes \dots \otimes A_n$  if certain matrices  $A_i$  ( $i = 1, \dots, n$ ) are replaced by corresponding unit matrices  $I_i$ .  $I_i$  is of the same type as  $A_i$ . A lemma which determinates the spectrum of the sum of normal summand if the spectrums of matrices  $A_1, \dots, A_n$  are known, is proved.

This lemma is applied in determining the spectrum of a graph denoted by  $G_{nbl}$ . Vertices of the graph  $G_{nbl}$  are all the ordered  $n$ -tuples of  $b$  symbols. Two  $n$ -tuples are adjacent if and only if they differ at least in one and maximum in  $2l$  coordinates.

I did not encounter in literature the above mentioned lemma, which, however, is not difficult to be deduced from several theorems of the matrix theory. This lemma can be applied in determining the spectrum of several graphs. It was implemented in [3] to determine the spectrum of the  $p$ -sum of graphs and in [6] to determine the spectrum of a generalization of the  $p$ -sum of graphs.

## 2.2. Bipartity, self-complementarity and connectivity and the spectrum of a graph

2.2.1. Bipartity. I have given in [1] a new proof of the following theorem, which is in several versions known in literature ([9], [16], [17]):

Finite, connected, undirected graph without loops and with at least two vertices (further graph) is bipartite if and only if its spectrum, considered as a set of points on the number axis, is symmetric to the point zero.

Apart from the new proof it seems that the contribution of the paper is in that that the theorem is proved also for the case when multiple edges exist in the graph. Besides, the following statement can be also proved by the method in [1]:

A graph is bipartite if and only if the number  $-r$  exists in its spectrum where  $r$  is the greatest number in the spectrum.

I have stated this in [3] and have used it for obtaining further results. This statement is known in literature only for regular graphs ([16], [17]).

2.2.2. Self-complementarity. I have proved in [4] the following theorem:

Let  $G$  be a self-complementary graph and  $\lambda_i$  an eigenvalue from its spectrum, of the multiplicity  $p_i$  ( $> 1$ ), (if it exists). Then to eigenvalue  $\lambda_i$  corresponds another eigenvalue  $\lambda_j$ , whose multiplicity is not less than  $p_i - 1$ , where  $\lambda_i + \lambda_j = -1$ .

In [18] an analogous theorem for the regular self-complementary graphs is proved. In somewhat altered formulation it reads:

In the regular self-complementary graph with  $n=4k+1$  vertices to each eigenvalue  $\lambda_i$  ( $\neq 2k$ ) corresponds another eigenvalue  $\lambda_j$ , where  $\lambda_i + \lambda_j = -1$ .

2.2.3. Regularity. Let  $q$  be the mean value of degrees of vertices in a graph, i.e.  $q = \frac{2p}{n}$  where  $p$  is the number of edges, and  $n$  the number of vertices. The greatest number in the spectrum is denoted by  $r$ . In [9] the following statement is proved:

A connected graph is regular if and only if  $q = r$ .

In [8] I have proved the same statement without assuming connectivity of the graph:

The graph is regular if and only if  $q=r$ .

Since  $q$  can be easily determined from the spectrum, it follows that the spectrum contains information about regularity of the graph.

### 2.3. Determination of the number of paths in a graph

The generating function (further g.f.) for the number  $N_k$  of the paths of lengths  $k$  is determined in [4], in the following form:

$$H_G(t) = \sum_{k=0}^{+\infty} N_k t^k = \frac{1}{t} \left[ (-1)^n \frac{P_{\bar{G}}\left(-\frac{t+1}{t}\right)}{P_G\left(\frac{1}{t}\right)} - 1 \right],$$

where  $P_G(t)$  is the characteristic polynomial of the adjacency matrix of the graph  $G$  and  $\bar{G}$  denotes the complement of  $G$ .

I did not find such a result in literature. In [19] g.f. for numbers of paths of length  $k$  between two given vertices is determined, but the characteristic polynomial of the complementary graph does not appear in it.

In [4] the connectedness between g.f. of the graph and its complement as well as between g.f. of a certain type of sum and the product of graphs and g.f. of graphs on which this operations are made, is given also.

The number of paths in a graph is connected with the number of variations with repetitions and with the restrictions of a certain type on a set, which is in biunic correspondence with the set of vertices of the graph.

||| a

Restrictions in the formulation of variation consist in that that the elements which may or may not appear after each given element in a variation are prescribed in advance. This relation enables the solution of several combinatorial problems.

The following combinatorial problem is solved in [7]: In how many ways the king (chess figure) can make a series of  $k$  moves on a chessboard of  $n \times n$  dimensions?

I have determined in [5] the expression for the number of paths in the  $p$ -sum of graphs. As it is already said in [5] this result can be extended to other types of operations on graphs.

#### 2.4. Graph products

A survey of several results on graph products can be found in [20]. Apart from the hitherto stated I searched connectivity and bipartity of the graph products.

I searched in [3] the  $p$ -sum of graphs. The following two theorems are given.

Theorem 1. Let  $G_1, \dots, G_n$  be finite, connected, undirected graphs without loops and multiple edges and with at least two vertices.  $p$ -sum of these graphs is a connected graph if and only if one of the following conditions holds:

- 1<sup>0</sup>  $p$  is equal to  $n$  and at most one of the graphs  $G_1, \dots, G_n$  is bipartite,
- 2<sup>0</sup>  $p$  is odd and less than  $n$ ,
- 3<sup>0</sup>  $p$  is even and less than  $n$ , where at least one of the graphs  $G_1, \dots, G_n$  is not bipartite.

If  $p$  is equal to  $n$  and exactly  $k (> 1)$  of the graphs  $G_1, \dots, G_n$  are bipartite, the  $p$ -sum has  $2^{k-1}$  components. If  $p$  is even and less than  $n$  and all the graphs  $G_1, \dots, G_n$  are bipartite, the  $p$ -sum has two components.

Theorem 2. The  $p$ -sum from the Theorem 1 is a bipartite graph if and only if one of the following conditions holds.

- 1<sup>0</sup>  $p$  is equal to  $n$  and at least one of the graphs  $G_1, \dots, G_n$  is bipartite,
- 2<sup>0</sup>  $p$  is odd and less than  $n$  and all the graphs  $G_1, \dots, G_n$  are bipartite.

The Theorem 1 represents a generalization of the results from [21], [22].

In the proof one uses the spectrums and eigenvectors of the adjacency matrices of graphs.

A generalization of the concept of the p-sum of graphs is given in [6]. Connectedness of the graph which is obtained by this generalized operation is researched. The method from [3] is applied. For the time being only one particular result is obtained.

### 3. Further possibilities

While elaborating this theme I would extend the up-to-now elaborated results. Especially I have in mind the following problem (in relation to which I have arrived at some results)

- a. Application of the method of variations with restrictions i.e. of the method of graph paths, to some combinatorial problems.
- b. Extension of results given in 2.4. to graph products, known as Boolean operations on graphs ([2d]).

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Prof. Dr. Horst Sachs  
DDR 63 Ilmenau  
Am Weizelsberg 12  
Deutsche Demokratische Republik

Thale, 21. Juli 1971

Herrn  
Professor Dr. D. S. Mitrović  
Smiljaniceva 38  
Beograd, Jugoslavia

Sehr geehrter Herr Kollege Mitrović!  
Ihre Sendungen vom 20. und 22. April  
dieses Jahres mit den Arbeiten von Herrn  
Cvetković und Ihren Brief vom 30. Juli  
habe ich mit Dank erhalten. Ich  
Sie sehr um Entschuldigung bitten,  
ich Ihnen erst heute hierauf antworte.  
Ich befinde mich nämlich gegenwärtig  
zu einem Kuraufenthalt (Heilkur gegen  
Herz- und Kreislaufstörungen) in Thale  
am Harz, und so mußte mir Ihr letzter  
Brief erst hierher nachgesandt werden.  
Ich hatte ohnehin die Absicht

von hier aus zu antworten, und ich  
bitte Sie sehr um Verständnis, daß das  
leider nicht früher möglich war. Bevor  
ich meinen Kuraufenthalt austrat, mußte  
noch für vier Doktoranden Gutachten  
angefertigt werden! Und leider ist meine  
gesundheitliche Verfassung gegenwärtig nicht  
die beste, jedoch spüre ich eine sehr wohl-  
tunende Wirkung der Bäder und fühle  
mich wesentlich besser als vor einigen  
Wochen.

Leider habe ich hier keine Schreibmaschine  
zur Verfügung, ich hoffe aber, daß auch ein  
handgeschriebener Brief den Anforderungen  
genügen wird. Ich schreibe deutsch, so  
geht es für mich ein wenig schneller, und  
ich bin überzeugt, daß Ihnen das Lesen  
keine Schwierigkeit bereiten wird.

Die Arbeiten von Cvetković bzw.  
Cvetković / Lučić habe ich mit großem  
Interesse gelesen; ich bitte Sie nur, in  
Betracht zu ziehen, daß ich ja hier keine  
Bibliothek zur Verfügung habe, auf die  
ich mich bei meiner Beurteilung  
stützen könnte.

Die Arbeiten von Cvetković - auch einige andere, die ich schon früher kannte zeigen, daß Herr Cvetković ein sehr solide arbeitender und wissenschaftlich denkender Mathematiker ist, der sich gut in die nicht gegenwärtig<sup>11</sup> auf dem Gebiet der kombinatorischen Strukturen vollziehende Entwicklung hineinzu denken und das Unwesentliche vom Wesentlichen zu trennen versteht. Die Suche nach - möglichst algebraisch erfassbaren - Invarianten zur Erfassung und Beschreibung von Eigenschaften kombinatorischer Strukturen (vor allem Graphen) halte ich für eine sehr wichtige Aufgabe, und Herr Cvetković leistet mit seinen Untersuchungen einen bemerkenswerten Beitrag zur Erweiterung und Vertiefung der Theorie der "Eigenwerte" eines Graphen. Wie Herr Cvetković in seinen Thesen (die ich jetzt für die (in der) Theorie) hervorhebt, haben die ... eine große Rolle in der Theorie ...

Große Anzahl von Autoren beschäftigt ist (Herr Cvetković spricht von etwa 100 Autoren auf diesem Gebiet), und sich stellt vor den Spezialisten dieser Theorie die Aufgabe, die vielen, scheinbar kaum untereinander in Verbindung stehenden Einzelergebnisse unter einheitlichem Gesichtspunkt zu einer höheren Qualität zusammenzufassen. Auch in diese Richtung zielen die Bemühungen von Herrn Cvetković.

In der Arbeit "New Characterizations of the cubic Lattice Graph" gibt Herr Cvetković, anknüpfend an Arbeiten von allem von R. Laskar, eine Charakterisierung des Würfelgittergraphen, bei der dessen Eigenwerte (das Spektrum) die entscheidende Rolle spielen (Theorem 3).

Es wäre ein schöner Fortschritt, wenn es ihm gelänge, auch noch die Eigenschaft ( $P_3'''$ ) zu eliminieren, doch sehe ich hierzu selbst keinen Anhaltspunkt.

Die Arbeit "A New Generalization of the Concept of the  $p$ -Sum of Graphs"

(zusammen mit P. Lučić verfasst)

knüpft an bereits früher gewonnene  
Resultate von Herrn Cvetković an und  
verallgemeinert diese.

In seiner Thesen ("Thema Proposed for the  
Doctorate Thesis") entwirft Herr Cvetko-  
vić ein Programm, das zur Vereinfachung  
wenigstens eines Teiles der Theorie der Eigenwerte  
führen kann und in dem bekannte sowie  
von ihm selbst gefundene Ergebnisse  
Berücksichtigung finden.

Aus meinem Sicht kann ich der zuständigen  
Fakultät nur empfehlen, die Arbeiten von  
Herrn Cvetković als Grundlage für ein  
Promotionsverfahren (Dissertation) zur  
Erlangung des Doktor titels zu akzeptieren.

Ich möchte nur erlauben, für Herrn  
Cvetković noch einige Gedanken bzw.  
Ausregungen hinzuzufügen.

Es wäre wohl an die Zeit, eine die in  
den verschiedenen Fachschriften erschienenen  
Einzelresultate zusammenfassende und  
ordnende Monographie über die Thesen

der Eigenwerte (des Spektrums) eines Graphen zu schreiben. Da Herr Cvetković sich tief in dieses Gebiet eingearbeitet hat, hätte er wohl (vielleicht in Gemeinschaft mit einigen Co-Autoren) beste Voraussetzungen für das Abfassen eines solchen Buches. Natürlich sollte diese umfangreiche Aufgabe nicht etwa zur Bedingung für seine Promotion gemacht werden, sondern vielmehr hierauf aufbauend nach Abschluss des Promotionsverfahrens geprüft und eventuell in nähere Erwägung gezogen werden. In diesem Zusammenhang möchte ich Herrn Cvetković auch auf die Anwendungen der „Spektralmethode“ in der Theorie der Block-Pläne (block designs) hinweisen: Vergleiche Arbeiten von Seidel (Technische Hochschule Eindhoven, <sup>Dept. of Math.</sup> Niederlande) und S. S. SHRIKHANDE (Dept. of Math., University of Bombay, Bombay - 32, India).

Helm J.  
Hoffman,  
IBM  
New York

Für die Definition des Spektrums werden verschiedene Ausgangspunkte gewählt, auch die Definitionen selbst weisen Abweichungen



auf, für reguläre Graphen stimmen sie jedoch im wesentlichen überein. Sie hat nun z. B.:

Ist  $f(\lambda)$  das charakteristische Polynom eines regulären Graphen  $G$  vom Grade  $r$  mit  $n$  Knotenpunkten und bedeutet  $f'(\lambda) = \frac{df}{d\lambda}$   $f(\lambda)$  so ist  $\frac{1}{n} f'(r)$  gleich der Anzahl der Gerüste von  $G$ .

Das stimmt jedoch nicht mehr, wenn  $G$  nicht regulär ist, und ich sehe <sup>damit</sup> auch keine Möglichkeit, die Anzahl der Gerüste durch die Eigenwerte auszu drücken. Hier ist eine andere Definition des Spektrums angemessener: Bezeichnet  $A$  (wie üblich) die Adjazenzmatrix und  $V = (v_{ij})$  (mit  $v_{ij} = 0$  für  $i \neq j$  und  $v_{ii} = \text{Valenz des Knotenpunktes } i$ ) die Valenzmatrix so wähle man als „Spektrum“ die Nullstellen des Polynoms  $\varphi(\lambda) = (-1)^n |A - \lambda V|$ . Faßt man  $G$  als elektrisches Netzwerk auf, dessen sämtliche Zweige den Wert (die Admittanz) 1 haben, so ist  ~~$A - \lambda V$~~   $V - A$  nichts anderes als die zugehörige Admittanzmatrix der Kirchhoff-Maxwell'schen Theorie - vielleicht sollte der Frage des Zusammenhanges zwischen der Theorie der elektrischen Netzwerke und der Theorie der Eigenwerte etwas Aufmerksamkeit geschenkt werden.

Während alle ~~bis~~ bisher betrachteten  
Spektren linearen Ansätzen entspringen  
(Spektrum = Gesamtheit der Eigenwerte  
eines dem Graphen in geeigneter Weise  
zugeordneten linearen Gleichungssystems)  
sind jedoch auch nichtlineare Ansätze  
möglich, die eventuell zu ganz neuen  
Einsichten führen können [ ich bin  
leider durch administrative Pflichten so sehr  
in Anspruch genommen, daß ich kaum  
Zeit habe, mich selbst etwas tiefergehend  
mit solchen Fragen zu beschäftigen ] ;  
einfachstes Beispiel (quadratischer Ansatz):  
Dem Knotenpunkt  $i$  wird die Variable  $x_i$   
zugeordnet; wir betrachten das Gleichungs-  
system

$$\lambda \cdot x_i^2 = \sum x_j x_k \quad (i=1,2,\dots,n)$$

(die Summation wird über alle Nachbar-  
knotenpunkte  $j, k$  ( $j \neq k$ ) von  $i$   
erstreckt) -

diejenigen Werte für  $\lambda$ , für die die  $n$   
Gleichungen kompatibel sind, bilden das  
"quadratische Spektrum".

Sicherlich können sich noch viele weitere  
Fragen aufwerfen. Ich würde mich sehr

freuen, wenn ich mit Ihnen und Ihren  
Mitarbeitern auch künftig guten Kontakt  
haben könnte, und bedauere nur zu sehr  
daß meine eigenen Forschungsmöglichkeiten  
durch Zeitknappheit gegenwärtig so sehr ein-  
geschränkt sind.

In der Hoffnung, Ihnen mit meinen  
Ausführungen vielleicht doch etwas gedient  
zu haben, bleibe ich

mit freundlichen Grüßen  
und vorzüglicher Hochachtung

Ihr

Horst Sachs

Prof. Dr. Horst Sachs  
DDR 63 Ilmenau  
Am Wenzelsberg 12  
Nemačka Demokratska Republika

Thale, 21. Juli 1970

Gospodin  
Profesor Dr. D.S. Mitrinović  
Smiljanićeva 38  
Beograd, Jugoslavija

Veoma uvaženi gospodine kolega Mitrinović !

Vaše pošiljke od 20. i 23. aprila ove godine sa radovima g. Cvetkovića i Vaše pismo od 30. juna sam primio sa zahvalnošću. Moram da Vas molim za izvinjenje što Vam tek danas odgovaram : Ja se sada nalazim na banjskom lečenju /zbog smetnji na srcu i krvotoku/ u Thaleu na Harzu i zato su mi Vaše poslednje pismo naknadno poslali ovamo. Ja sam bez daljeg imao nameru da Vam odavde odgovorim i ja Vas molim da me razumete da to ranije nije bilo moguće : Pre mog dolaska u banju morao sam za još četiri doktoranda da dam mišljenje. A, na žalost, moje zdravstveno stanje nije baš najbolje, mada osećam povoljno dejstvo kupanja i osećam se mnogo bolje nego pre nekoliko nedelja.

Na žalost, ovde nemam na raspoloženju pisaću mašinu, ali se nadam da će i rukom pisano pismo zadovoljiti svrhu. Ja pišem nemački, tako mi je nešto brže, i uveren sam da Vam čitanje neće predstavljati teškoću.

Radove Cvetkovića odnosno Cvetkovića i Lučića sam pročitao sa velikim interesom; molim Vas samo da imate u vidu da mi ovde ne stoji na raspoloženju biblioteka na koju bi se pri mojim ocenama mogao da oslonim.

Radovi Cvetkovića - takodje neki koje znam od ranije - pokazuju da je g. Cvetković matematičar koji solidno radi i naučno misli i koji dobro ume da se zamisli nad razvojem koji se sada odigrava na polju kombinatorni struktura i nebitne od bitnog razdvoji. Traženje invarijanata /koje se što je moguće više mogu algebarski tretirati/ za obuhvatanje i opisivanje oscilacija kombinatornih struktura /pre svega grafova/ smatram vrlo važnim sadatkom i g. Cvetković sa svojim istraživanjima čini jedan doprinos, vredan pažnje, proširenju i objedinjavanju teorije "sopstvenih vrednosti" grafa. Kao što g. Cvetković u svojoj tezi /Theme proposed for the Doctorate Thesis/

ističe, ovom teorijom se u poslednjih nekoliko godina bavio veliki broj autora /g. Cvetković govori o nekih sto radova iz ove oblasti/, ali pred specijalistima te teorije tek stoji zadatak da mnoge, prividno u nekoj ve jedva stojeće, pojedinačne rezultate polazeći sa jedinstvenog stanovišta objedine, čime bi se dobio novi kvalitet. Takodje u tom pravcu su usmereni napori g. Cvetkovića.

U radu "New Characterisations of the cubic Lattice Graph" daje g. Cvetković, nadovezujući se na radove pre svega R. Laskara, jednu karakterizaciju grafa kubne rešetke pri kojoj sopstvene vrednosti /spekter/ grafa igraju odlučujuću ulogu /Teorema 3./. Bio bi lep napredak ako bi mu uspelo da eliminiše i osobinu  $(P_3^{III})$ , iako sada i sam ne vidim sa to neku polaznu tačku.

Rad "A new Generalization of the Concept of the p-Sum of Graphs" /napisano zajedno sa P. Lučićem/ nastavlja se na ranije dobijene rezultate g. Cvetkovića i generališe ove.

U svojoj tesi /"Theme Proposed for the Doctorate Thesis"/ sačinjava g. Cvetković jedan program koji može da dovede do objedinjavanja bar jednog dela teorije sopstvenih vrednosti i da usme u obzir poznate kao i njegove sopstvene rezultate.

Sa mog stanovišta ja samo mogu nadležnom fakultetu da preporučim da radove g. Cvetkovića akceptira kao osnovu za postupak promocije /dissertaciju/ za postizanje doktorske titule.

Slobodan sam da sa g. Cvetkovića priključim neke misli odnosno pobude:

Bilo bi već vreme da se napiše monografija teorije sopstvenih vrednosti /spektra/ grafa, koja bi obuhvatila pojedinačne rezultate koji su objavljeni u različitim časopisima. Pošto se g. Cvetković udubio u ovu oblast, imao bi on naravno /možda u zajednici sa nekim koautorima/ najbolje predispozicije za izradu jedne takve knjige. Naravno ovaj obiman zadatak ne bi trebao da bude vezan za njegovu promociju, nego ... posle završetka postupka promocije da bude ispitan i eventualno uzet u bliže razmatranje. U vezi sa ovim želim da skrenem pažnju g. Cvetkovića i na primene "spektralne metode" u teoriji blok-šema /block designs/: Uporedi radove Seide /Tehnička visoka škola Einthoven, Dept. of Math., Holandija/, Allan J. Hoffman /IBM, New York, i S.S. Shrikhande /Dept. of Math., University of Bombay, Bombay - 32, India/.

Prilikom definisanja spektra se polazi sa različitih stanovišta same definicije pokazuju odstupanja; sa regularne grafove se one u suštini

poklapaju. Tako imamo, na primer, :

Ako je  $f(\lambda)$  karakteristični polinom regularnog grafa  $G$  stepena  $r$  sa  $n$  čvorova i ako uvedemo oznaku  $f'(\lambda) = \frac{d}{d\lambda} f(\lambda)$ , tada je  $\frac{1}{n} f'(r)$  jednako broju stabala iz  $G$ .

Ovo više nije tačno ako  $G$  nije regularan graf i ja onda ne vidim mogućnost da se broj stabala izrazi pomoću spektra. Ovde odgovara druga definicija spektra: Ako  $A$  /kao što je uobičajeno/ označava matricu susedstva grafa i  $V = (v_{ij})$  /gde je  $v_{ij} = 0$  za  $i \neq j$  i  $v_{ii} =$  stepenu čvora  $i$  / matricu stepena čvorova, tada se kao "spektar" uzimaju nule polinoma  $\varphi(\lambda) = \det |A - \lambda V|$ . Ako se  $G$  shvati kao električna mreža, čije sve grane imaju provodnost /admitansu/ jednaku 1, tada je  $V - A$  ništa drugo nago odgovarajuća matrica admitansi iz Kirchoff-Maxwellove teorije - možda bi trebale izvesnu pažnju pokloniti pitanju veze između teorije električnih mreža i teorije sopstvenih vrednosti.

Dok svi do sada razmatrani spektri imaju linearnu osnovu /spektar skup sopstvenih vrednosti linearnog sistema jednačina koji je na naročit način pridružen grafu/, moguće su takodje i nelinearne osnove, koje bi eventualno mogle da dovedu do sasvim novih saznanja /ja sam, na žalost, toliko zauzet administrativnim obavezama, da ja jedva imam vremena da se nešto dublje bavim sa takvim pitanjima/ ; jedan jednostavan primer /kvadratne osnove/ : čvoru  $i$  se pridružuje promenljiva  $x_i$  ; posmatrajmo sistem jednačina

$$\lambda x_i^2 = \sum_{j,k} x_j x_k \quad (i = 1, 2, \dots, n)$$

/sumiranje se vrši posvimi susednim čvorovima  $j, k$  ( $j \neq k$ ) čvora  $i$  / - one vrednosti  $\lambda$ , sa koje su  $n$  jednačina kompatibilne, obrazuju "kvadratni spektar".

Sigurno je da se još mnoga dalja pitanja mogu postaviti. Ja bih se veoma rado bavio, kada bi mogao i ubuduće sa Vama i Vašim saradnicima da imam dobar kontakt i veoma želim što su moje sopstvene mogućnosti istraživanja sada tako mnogo ograničene zbog oskudice vremena.

U nadi da sam Vam ipak možda sa mojim izvedima nešto poslužio ostajem

sa prijateljskim pozdravima  
i dubokim poštovanjem

Vaš  
Horst Sachs

## UČESNIKU KONGRESA

S obzirom na vašu struku i vrstu vašeg saopštenja, a po vašoj želji izraženoj u prijavi za Kongres, i prema mogućnostima smeštaja, raspoređeni ste (Vi i vaša

drugarica-~~ica~~) u objektu..... *Jyropem " B*

Cena kompletnog šestodnevnoh pansiona po gornjem programu za ovaj

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Napominjemo da svaki korisnik prevoza dobija potvrdu na iznos iz odabrane variante radi pravljanja uz putni račun.

Molimo da gornji iznos pansionskih usluga, zajedno sa iznosom za prevoz po izabranoj varijanti uplatite najkasnije do 5. VIII. 1970 godine u korist žiro računa broj 401-1-91 na ime PUTNIK, Skopje.

Rok otkaza naručenih usluga ili eventualna korekcija je 15. VIII. 1970 godine posle koga rokovi povlače plaćanje stvarnih i manipulativnih troškova.

Prilažemo uplatnicu radi blagovremene uplate iznosa iz aranžmana.

Isto tako prilažemo i formular za rezervaciju koji popunjen molimo da bude poslat najkasnije do 15. VI. 1970 godine.

*Ente van sudu  
je Boc amolno  
Rugula  
Zvezdovica  
CC je 1970*

# V KONGRES

matematičara, fizičara i astronoma Jugoslavije

## DRUGO SAOPŠTENJE UČESNIKU KONGRESA

O H R I D

14 do 19. septembra 1970



Savez društava matematičara, fizičara i astronoma Jugoslavije

# GLASNIK MATEMATIČKI

Marulićev trg 19 — P.P. 314  
Zagreb, Jugoslavija

Zagreb,  
20.sept.1970.

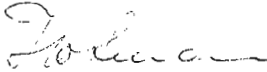
Br.166/70

Drug  
Dragoš Cvetković  
Lamartinova 44  
B e o g r a d

U prilogu Vam šaljem Vaš članak "Die Zahl der Wege eines Grafen" s molbom da ga što prije korigiranog vratite redakciji "Glasnika matematičkog".

Sa srdačnim pozdravom

Za uredništvo Glasnika matematičkog:

  
Nada Hofman



Beograd, 23.9.1970.

Poštovani profesore Stojaković,

Najpre želim da Vam se zahvalim što ste prihvatili učešće u komisiji za prihvatanje moje doktorske disertacije.

Pošto je moj predmet juče i zvanično prošao kroz Veće Elektrotehničkog fakulteta, prof. Mitrinović me je obavestio da ~~Vi~~ ćete Vi, prema ranijem dogovoru, napisati referat i savetovao mi da Vam lično dostavim potrebnu dokumentaciju. Međutim danas Vas nisam našao u Institutu te sam slobodan da Vam se obratim pismeno.

Šaljem Vam zvaničan akt fakulteta za Vas zajedno sa mojom prijavom teze. Obzirom da Vam mogu zatrebati razni drugi podaci šaljem Vam i sledeće priloge :

1. Biografija ,
2. Predlog teme za doktorsku disertaciju: "Grafovi i njihovi spektri" / kratak opis dosadašnjih rezultata u vezi sa spektrima grafova kao i onoga što mislim da izložim u disertaciji /
3. Prevod pisma profesora H.Sachsa profesoru Mitrinoviću koje se odnosi na moje radove /original se nalazi kod prof.Mitrovića/,
4. Belešku o pismu profesora L.Collatz-a ,
5. Separate i rukopise nekih mojih radova ,
6. Pismo prof. H.Sachsa koje se odnosi na dva moja rada,
7. Dopis iz Glasnika matematičkog kojim me obaveštavaju da su primili za štampu jedan moj rad.

Ukoliko se ranije ne sretnete sa prof.Mitrovićem odnosno prof. Mihailovićem, ja ću Vas potražiti u iduću sredu u Mat.Institutu.

Pozdravlja Vas

SAVEZ DRUŠTAVA MATEMATIČARA, FIZIČARA I ASTRONOMA JUGOSLAVIJE

Organizacioni odbor V kongresa

Skopje, p. f. 162

Poštovani kolega,

Organizacioni odbor V Kongresa matematičara, fizičara i astronoma Jugoslavije zahvaljuje na Vašem učešću na Kongresu i na Vašem saopštenju, koje je doprinelo da ova naša zajednička manifestacija bude što uspešnija.

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Odbor ima tu čast da Vas zamoli da po Vašoj želji spremite Vaše saopštenje za štampu, i pri tome preporučuje da ono zauzima prostor od 5 stranica na jednom od jugoslovenskih jezika zajedno sa obavezanim rezimeom na jednom od stranih jezika, ili obratno. Zbog obimnosti knjige, molimo Vas da izbegavate slike i crteže.

Rukopis otkucan na mašini sa normalnim proredom treba dostaviti u dva primerka na gornju adresu najkasnije do 31 decembra 1970 godine. Popis literature izvršiti po ugledu na Comptes rendus. U zavisnosti od prispelog materijala odbor će izvršiti podelu knjige na tomove, po strukama i oblastima.

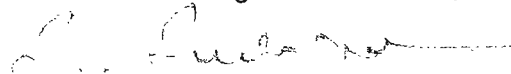
Koristimo priliku da se još jednom zahvalimo na Vašim naporima.

Skopje, 12.X.1970

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# ЗАВОД ЗА ИЗДАВАЊЕ УЧБЕНИКА СОЦИЈАЛИСТИЧКЕ РЕПУБЛИКЕ СРБИЈЕ

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(14) Број 464/63

Знак 11/38

Друг

DRAGOŠIĆ DRAGOŠIĆ

БЕОГРАД

Ocenjivačka grupa za matematiku pri Zavodu za izdavanje udžbenika SR Srbije organizuje 21. i 22. oktobra 1970. godine stručno-konsultativni sastanak sa prosvetnim savetnicima za matematiku koji rade u opštinskim, medjuopštinskim i pokrajinskim Zavodima za prosvetno-pedagošku službu na teritoriji SR Srbije i SR Crne Gore.

Sastanak će se održati u prostorijama Zавода, Beograd, Kneza Miloša 9 - Dom inžinjera i tehničara Jugoslavije.

Početak rada je 21. oktobra u 9 časova.

Na dnevnom redu:

- 21.X 1970. 1. Matematička logika u nastavi matematike u osnovnoj školi - Mr M. M. Nikolić
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3. O matematičkim strukturama - Dr Slobodan Aljančić
- 22.X 1970. 1. Diskusija o Predlogu korigovanog programa matematike za osnovnu školu
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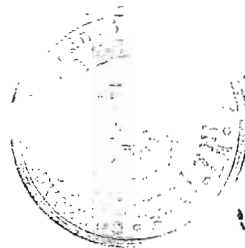
Molimo Vas da učestvujete u radu tokom planiranog stručnog sastanka.

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Mirko Šijački

*Mirko Šijački*



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Katedra za matematiku  
~~Elektrotehnički fakultet~~  
Belgrad / Jugoslawien

Re: Author abstract No. 005042  
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Germany**

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..... not be a short  
summary but should comply in size and form with a normal  
review (although criticism will not be expected). An  
abstract may be amended if the author has meanwhile ob-  
tained further relevant information. The abstract may be  
written in English, French or German.

If you cannot send us your abstract within a period of  
eight weeks, we should very much appreciate it if you  
would return the enclosed form at your earliest conven-  
ience.

Hoping that we shall have your support, we remain

Yours faithfully



2057  
4-XII-1970 год.  
БЕОГРАД

REPUBLIČKOJ ZAJEDNICI ZA NAUČNI RAD  
BEOGRAD  
ODBOR ZA KADROVE

Mišljenje Elektrotehničkog fakulteta u Beogradu u vezi sa konkurisanjem Dragoša Cvetkovića za stipendiju za studijski boravak u inostranstvu

Dragoš Cvetković je zaposlen na Elektrotehničkom fakultetu u Beogradu od 1.1.1965. u svojstvu asistenta Katedre za matematiku. Njegovo opredeljenje je rad na teoriji grafova i iz ove oblasti je objavio devet radova. Teorija grafova, koja inače predstavlja jednu od modernih oblasti matematike, je malo obrađivana od strane jugoslovenskih matematičara i Cvetković je iscrpeo sve postojeće mogućnosti usavršavanja u zemlji.

Katedra za matematiku je stupila u vezu sa Visokom tehničkom školom u Ilmenau ( Demokratska Republika Nemačka ), gde se teorija grafova posebno neguje. Smatramo da bi bilo korisno da Cvetković stupi u lični kontakt sa matematičarima iz Ilmenaua, te Vas molimo da mu odobrite stipendiju za studijski boravak u inostranstvu.

4

Dr. WEI  
Sidney Sussex College  
CAMBRIDGE, England

10th December 1970

Dear Sir,

As I am working on a problem in theory of graphs, I must look through the papers dealing with spectrums of the adjacency matrices of graphs.

In several papers as well as in C.Berge's monography, your thesis "The algebraic foundations of ranking theory" is quoted. Through our Library I turned to Cambridge University Library with request to send me a copy of your thesis. They kindly replied that your written permission is necessary.

I am most kindly requesting you to permit to the Cambridge University Library to send to me a microfilm of your dissertation. The permission may be sent either to me, or, if you find it more convenient, directly to Cambridge University Library, informing me about it. At the same time I would appreciate your information on whether your dissertation in its entirety or in excerpts was published anywhere.

Looking forward with great interest to your news,

Sincerely Yours

Dragoš Cvetković

Beograd, 23.12.1970.

Poštovani profesore Devidé ,

Prof. Mitrinović mi je rekao da ste prihvatili učešće u komisiji za pregled i ocenu moje doktorske disertacije pod naslovom "Grafovi i njihovi spektri". Ja Vam na tome najsrdačnije zahvaljujem.

Istovremeno mi je prof. Mitrinović saopštio da oko Nove godine planirate odlazak u inostranstvo. Stoga sam ja nastojao da disertaciju što pre završim pa i da Vam je lično, u Zagrebu, predam. Međutim, usled izvesnih razloga sam bio sprečen u tome te Vam tek sada mogu poslati jedan primerak disertacije. Svestan sam toga da, ako zaista odlazite o Novoj godini, nemate vremena da je proučite; ipak, šaljem Vam je u nadi da će te zbog eventualnog odlaganja odlaska ili na drugi način moći da pošaljete prof. Mitrinoviću svoje mišljenje.

Ja još nisam zvanično predao fakultetu disertaciju; to ću učiniti za nekoliko dana, pošto je prof. Mitrinović pročitao. Nadam se da će se ti zvanični primerci, koji će biti tehnički nešto bolje uredjeni, minimalno razlikovati od ovoga koji Vam šaljem. Naravno, ja ću Vam poslati i zvaničan primerak ako to bude bilo moguće zbog Vašeg odlaska.

Najlepše Vas molim da o svemu ovome obavestite mene ili prof. Mitrinovića direktno.

Čestitajući Vam istovremeno Novu godinu, najsrdačnije Vas pozdravlja

Dragoš Cvetković

Adresa: Beograd, Lamartinova 44



ORGANIZACIONI ODBOR V KONGRESA MATEMATIČARA, FIZIČARA I  
ASTRONOMA JUGOSLAVIJE

S k o p j e , p.f. 162

Šaljem Vam moje saopštenje "Booleove operacije nad grafovima -  
spektar i povezanost", koje sam održao na V Kongresu u sekciji za algebru.  
nad je napisan na engleskom jeziku sa rezimeom na srpsko-hrvatskom.

Molim Vas da me izvinete zbog izvesnih tehničkih nedostataka  
u rukopisu. Ipak, rukopis je pažljivo korigovan i mislim da je jasan za  
slovoślagače. S obzirom na margine i prored rukopis ne premaša dužinu  
koju ste preporučili kao optimalnu.

Ako to bude mogućno, rado ću izvršiti korekturu svoga članka.

Pozdravlja Vas

Dragoš Cvetković

Beograd, 24.12.1970.

Adresa : Beograd, Lamartinova 44

ZENTRALBLATT FÜR MATHEMATIK

1 Berlin 62

Akazienstr. 31

D.Cvetković

R.Lučić

5th January 1971

Dear Sirs,

We would prefer our papers to be reviewed by someone else. That is why we enclose herewith the forms which you kindly sent to us.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Radomir Lučić

Sidney Sussex College,  
Cambridge,  
England.

15th January, 1971.

Prof. D. Cvetković,  
Faculty of Electrical Engineering,  
University of Belgrade,  
Bulever Revolucije, 73,  
Beograd,  
Yugoslavia.


Dear Sir,

Thank you very much for your letter of 10th December, 1970. I apologize for not being able to reply until now.

As you suggested, I am now sending a letter to the University Library, Cambridge, certifying my consent to your having a copy made of my old thesis entitled "The Algebraic Foundations of Ranking Theory". Herewith I enclose a carbon copy of this letter. I believe they will offer you such facilities when you get in touch with them again.

The said thesis has not been published in its entirety, but a summary appeared in "Abstracts of Dissertations in the University of Cambridge, 1952-53", The University Press, Cambridge.

Yours sincerely,



T.-H. Wei.

Enc.

Sidney Sussex College,  
Cambridge.  
15th January, 1971.

The Librarian,  
University Library,  
Cambridge.

Dear Sir,

This is to certify that I give my consent to Prof. D. Cvetković of University of Belgrade to make a copy of my thesis entitled "The Algebraic Foundations of Ranking Theory" (1952).

Once again I should be grateful if you would offer him facilities for making such a copy.

Yours truly,

T.-H. Wei.

Beograd, 15.2.1971.

Poštovani profesore,

Šaljem Vam akt fakulteta kojim se imenujete za člana Komisije za pregled i ocenu moje doktorske disertacije.

Prof. Mitrinović mi je rekao da ste sami sebi poslali primerak disertacije koji sam Vam ranije poslao. Taj se primerak ne razlikuje od primeraka koje sam podneo fakultetu, izuzev minimalnih izmena u pogledu pravopisa i sledeće dve omaške koje su se podkrale i za koje Vas molim da ih ispravite u Vašem primerku :

K1. Svršetak primera 2.6 sa str.38 treba da glasi :

... Komplement ovog grafa sadrži, kao komponente povezanosti,  $m$  regularnih grafova stepena  $l$  i  $n - 2m$  izolovanih čvorova. Stoga je

$$H_G(t) = m \frac{2}{1-t} + n - 2m = \frac{n - t(n - 2m)}{1-t} \text{ i, na osnovu (2.29),}$$

$$H_G(t) = \frac{n - t(n - 3) - 2t(n - m - 1)}{(1-t)(n - 3 - 2(n - m - 1)t)^2}.$$

2. Formula (3.4) sa str. 38 treba da glasi

$$(3.4) \quad P_{L(G)}(\lambda - 2) = \lambda^{m-n} \det(\lambda I - A - D)$$

Pozdravlja Vas

Dragoš Vekarić  
Beograd, Lamartinaeva 144

11.000

Dragoš Cvetković

M.D. Plummer

Vanderbilt University  
Department of Mathematics  
NASHVILLE, Tenn. 37203

17th February 1971

Dear Professor Plummer,

Please find enclosed two reprints of my papers:  
"New Characterization of the Cubic Graph" and "Die  
Zahl der Wege Eines Grafen".

Thanking you for the interest you are taking in  
my work, I remain, Sir,

Yours Sincerely

Dragoš Cvetković

Columbus, Ohio

THE OHIO STATE UNIVERSITY

DEPARTMENT OF MATHEMATICS  
231 W. 18TH AVENUE  
COLUMBUS, OHIO 43210

Prof. [Name],

I am writing you this morning [Date]. I am  
very interested in your work on [Topic] and  
would like to know more about it. I am  
enclosed a few questions that I hope you  
can answer. I am sure you will be  
able to help me. I am looking forward  
to hearing from you soon. Thank you  
very much for your time and attention.

Sincerely,  
[Name]

11.000

Dragos Cvetković  
Lamartinova 44  
11.000 Belgrade  
Yugoslavia

ACTA MATHEMATICA  
BUDAPEST 502  
Postafiók 24  
Hungary

24th February 1971

Dear Sirs,

Please find enclosed herewith my paper entitled:

INEQUALITIES OBTAINED ON THE BASIS OF THE SPECTRUM OF THE GRAPH

I am submitting this paper with the kindest request to take it into consideration for publishing in your journal.

I am looking with interest forward to your news,

Yours Sincerely



Dragos Cvetković



INZ, D. CVETKOVIC  
LAPANTINOVA 44  
BELGRADE  
YUGOSLAVIA.

Please simplify your subjects (maximum total 12) in the right hand column, and correct your address. If you wish to make no alterations we should be grateful if you could nevertheless return the questionnaire.

MAIN RESEARCH INTERESTS  
MATHEMATICS

(New) Main Teaching Interests

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(New) Main Research Interests

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Other Interests

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Your comments

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for BDC use



# Book Development Council

1970-1971

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BDCN/33/70

Dear Sir/Madam,

As I am sure you are already aware, BDC operates a world-wide service designed to keep you informed of the latest academic books and journals in your fields of interest. The service has now been operating for three years and we are finding that it is proving increasingly successful. We hope that you will find it increasingly international. The service is of course entirely free.

A copy of your entry on our file is printed overleaf and we would be grateful if you could amend it if necessary, using the enclosed Guide to Subjects. May we emphasise that our service is a precise one, and it is therefore in your interest to scrutinise the list most carefully. PLEASE DO NOT USE THE BROAD GENERAL HEADINGS UNLESS THEY ARE REALLY RELEVANT TO YOUR TEACHING OR RESEARCH INTERESTS. May we also draw your attention to the subjects with asterisks, which have been added since last year.

Last year a number of people remarked that they had not received any information from us. We would like to point out that often material does not bear our name, only that of the publisher. Our address label should however be recognisable. You should now also receive at regular intervals our own publications 'New British Books' on relevant topics.

We hope that you find our service useful, but please let us have any comments or suggestions you may have. An envelope is enclosed for your reply.

Yours faithfully

Alastair Gordon  
Research Manager

D.M.Cvetković

Curtiss E. Wall  
Olivet College  
Olivet, Michigan 49076

Dear Mr. Wall,

Please find enclosed herewith the paper: "New Characterization of the Cubic Lattice Graph", which you requested.

Thanking you for the interest shown in my paper, I am  
Sir,

Yours Sincerely

D.Cvetković

26.3.71

D.M. Cvetković

Mr. Michael Doob  
Department of Mathematics  
The University of  
Manitoba  
Winnipeg, Manitoba Canada

Dear Sir,

Please find enclosed herewith the reprint  
of my paper entitled: Die Zahl Der Wege Eines Grafen.

Thanking you for the interest shown in my  
paper, I am

Yours Sincerely

D.M.Cvetković

- Izdavačka delatnost -

Beograd, 20. 11. 1971.

Broj: 273

## UGOVOR

zaključen između Beogradskog grafičkog zavoda — Izdavačka delatnost — iz Beograda, Bulevar vojvode Mišića br. 17 (u daljem tekstu Izdavač), s jedne strane, i druga-drugarice dr Irina Ilić i porodica Votkovića iz Beograda, sa stanom u Solunska 9 i Lamartinova 44 (u daljem tekstu Autori), s druge strane.

Ugovor sadrži sledeći sporazum:

Autori se obavezuje da za Izdavača sva dela "Uvod u teoriju trafova i analiza električnih mreža" će sa jezičke i stručne strane biti korektan, uredno otkucan u dva primerka, sa svim priložima, potpuno pripremljenim za štampu.

Eventualno prekucavanje rukopisa posle lekture pada na teret Autora.

2. Autori ustupa ustupa Izdavaču svoj rukopis za izdavanje u tiražu do 1.500 primeraka. Svako sledeće izdanje Autori dužan je da ponudi Izdavaču. Međutim, ako Autori i Izdavač ne postignu saglasnost oko uslova sledećeg izdanja, Autori su vlasni je vlasnik ponuditi svoje delo drugom izdavaču, s tim da uslove postignute s drugim izdavačem saopšti prvom (izdavaču, pa tek ako ih ovaj ne prihvati, može sklopiti ugovor s drugim izdavačem.

Rok za predaju rukopisa utvrđuje se za rukopis je predat.

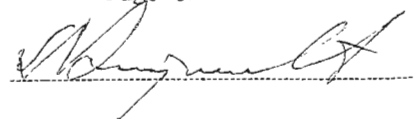
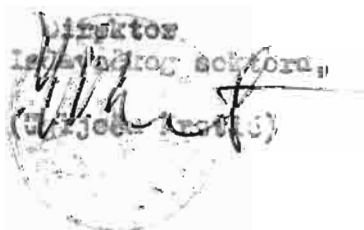
3. Izdavač se obavezuje da na ime autorskog honorara isplati autorima ND 600,00 (slovima šest stotina dinara) po jednom autorskom tabaku, i to 30% po potpisu ovog ugovora, 80% po predaji rukopisa potpuno pripremljenog za štampu, a ostatak po izlasku dela iz štampe.

Autovima pripada deset primerka odštampane knjige besplatno.

4. Korekturu ovog dela vršiće korektori Izdavača, a ako Izdavač nađe za potrebno, Autori će pregledati jednu od revizija i tom prilikom rešiti sva sporna pitanja i knjigu odobriti za štampu. Prilikom vršenja revizije nisu dozvoljene nikakve ispravke teksta složenog prema rukopisu, a ako ih Autori ipak unese, troškovi njima izazvani padaju na njegov teret.

5. Ovaj ugovor sačinjen je u tri ravnoglasna primerka, od kojih se jedan nalazi kod, a dva kod Izdavača.

ZA IZDAVAČA  
Odgovorni urednik

AUTOR  
Ir. Ilić  
dr Irina Ilić  
Ulica Solunska 9  
Mesto Beograd  
Opština: Starigrad  
Žiro-račun: Vračar

**ACTA MATHEMATICA**  
ACADEMIAE SCIENTIARUM HUNGARICAE  
REDIGIT G. HAJÓS  
BUDAPEST, VIII., MÚZEUM KÖRÚT 6-8.

Budapest, May 10, 1971

Prof. D. Cvetkovic

Belgrad

Dear Sir,

We have received your paper

Inequalities obtained on the basis of the spectrum of the graph  
for publication in the Acta Mathematica, and handed it over to our reviewer.

Sincerely yours,

*J. Lovász*  
(~~J. Szabados~~)

Technical Editor



THE UNIVERSITY OF MANITOBA

DEPARTMENT OF MATHEMATICS AND ASTRONOMY

WINNIPEG, CANADA

July 6, 1971

Dr. Dragoš Cvetković,  
Lamartinova 44,  
Beograd, Yugoslavia

Dear Dr. Cvetkovic:

I would appreciate it if you could send me a copy of your paper entitled "Spectrum of the graph of N-Tuples". Enclosed is a preprint of a paper of mine on a closely related topic.

Thank you very much.

Sincerely,

Michael Doob

MD:nb  
Enc.

ПРИРОДНО-МАТЕМАТИЧКИ ФАКУЛТЕТ

Декан  
dr Mirko Stojaković

Нови Сад, 10 juli 1971

Dragi Kolega Cvetkoviću!

Dobio sam pre neki dan tekst na engleskom ali nisam još stigao da ga pogledam. Sutra polazim na godišnji odmor pa ću poneti da tamo, kad stignem i koliko stignem, pregledam a kad se vratim intenzivnije ću se posvetiti tome. Ako Vam se žuri Vi me izvestite kada najkasnije treba da stigne i po neka moja primedba ako je uopšte bude.

Srdačno Vas pozdravlja

M. Stojaković





14th July 71

Mr. Michael Dobb  
Department of Mathematics  
University of Manitoba  
Winnipeg, Canada

Dear Sir,

Thank you very much for your letter of 6.7.71.

I am glad that we are working on very close matters, and I hope that my papers, herewith enclosed, will be useful to you. I have recently defended the Thesis entitled: "Graphs and their spectrums", which will soon be published in English, and I shall send it to you. The Thesis contains as one of the results, a characterization of  $L(K_{m,n})$  which I obtained independently of you.

I am an Assistant at the Mathematical Chair of the Faculty of Electrical Engineering, Beograd. The Head of the Chair is Professor D.S. Mitrović. I would like to keep exchanging information on our and other papers from the field in which we both are interested. I would like to know whether any Proceedings of a conference on graph theory were published in America in 1970-71.

If your Faculty is not receiving the Publications of the Faculty of Electrical Engineering, Series mathematics and Physics, and if you are interested in getting them, you may address, through your Library Professor Mitrović - editor. Our Publications are sent, in principle, on the exchange basis.

With kind regards,

Yours Sincerely

D. CVETKOVIĆ

Beograd 24.7.1971.

Poštovani profesore Marjanović ,

Šaljem Vam moj rad "New characterizations of the cubic lattice graph" za Takmičenje mladih matematičara Balkana .

Moram odmah da Vam napomenem da sam napunio trideset godina u martu ove godine . Rad Vam ipak šaljem po savetu profesora Kurepe koji smatra da imam pravo da učestvujem u takmičenju.

Evo nekoliko podataka o radu :

Rad je saopšten 18.3.1971. u Matematičkom institutu u Odeljenju za algebru u vezi sa temom "Proučavanje grafova pomoću matrice susedstva i njenog spektra" . Recenzent je bio prof. M.Stojaković a rad je objavljen u Publ.Inst.Mat. Beograd 10 24 1970 , 195 - 198 . Rad je povoljno referisan u Zbl. 202 , 557 referent G.Chartrand i u RŽ MAT 1971 , 6V374 , referent A.Petrenjuk . Iz Amerike su separate rada tražili M.D.Plummer i C.E.Wall .

Pozdravlja Vas

dr Dragoš M. Cvetković

Adresa : 11000 Beograd , Lamartinova 44

Prešov, 26. VII. 71

Kráľ koloza Čučkovi,

Pregledao sam Vaš rukopis. Što se tiče matematičke strane teksta nemam nikakvih primjedbi, niti naičelnih niti u pogledu pojedinosti. Naravno, budući da mi teorija grafona nije nje podnoje interese, ne mogu garantirati da neki nje studij može ne bi vidio nešto što sam ja previdio. Međutim, koliko mogu procijeniti, rukopisu nema zamjerke i mislim da se može štampati ovakav kakav jest.

Što se tiče jezika, označio sam nekoliko manjih sugestija za izmjenu, od kojih većina nije bitna, tj. kod većine se ne radi o efektivnoj gramatičkoj ili pravopisnoj grešci, već jedino o varijanti u stilu i rečenju. Budehve sam sugestije označio crvenom olovkom u tekstu, da se lakše vidi; proveo sam ih do 20. stranice rukopisa a dalje ne, jer se i dalje ponavljaju uglavnom (gotovo istifinjno) iste stvari, pa ćete ih lahko sami nositi kod citiranja rukopisa. %

S grafičko - tehničke strane, obzirom da :  
velik radovi daste definicije i mnogo teorema kao i  
primera, može li, za dafe "estetsko" poboljšanje  
teksta, što zgodno da npr. definicije i teoremi budu  
glavni u kursivu, a primeri u fetitu ; time se  
od opsežnih rukopisa kao što je "Kaj" može izbjeći  
eventualna "vizuelna monotoniya". Vjerovatno li  
što najbolje da se o tome konzultirate s  
prof. Mitinovićem, koji će sigurno preporučiti  
najbolje rješenje.

Iskreno Vas pozdravlja  
Vladimir Jaku



THE UNIVERSITY OF MANITOBA

DEPARTMENT OF MATHEMATICS AND ASTRONOMY

WINNIPEG, CANADA

August 23, 1971

Dr. Dragoš Cvetković,  
Lamartinova 44  
11000 Beograd,  
Yugoslavia.

Dear Sir:

Thank you very much for your letter and the enclosed reprints. I have found them quite interesting. I see that we have obtained several results simultaneously. I would be most anxious to see a copy of your thesis and look forward to receiving it. Congratulations on your recent defense of your thesis.

I am enclosing several papers that might be of interest to you. They are in various stages of publication; unfortunately it takes us much longer than it takes you to get a manuscript printed in a journal.

The following proceedings have been published:

1. International Conference on Combinatorial Mathematics. Annals of the New York Academy of Sciences (1970) Article 1, volume 175, pages 1 - 412.
2. Proceedings of the Second Chapel Hill Conference on Combinatorial Mathematics and its Applications, University of North Carolina, Chapel Hill, 1970.

In addition there were conferences held at St. Johns University in New York City in June of 1970, at Louisiana State University in March of 1970 and March of 1971 for which proceedings have been published. If you wish, Michael Capobianco at St. Johns and Don Roselle at Louisiana State could get copies for you at a nominal cost. A symposium is being held this September at Colorado State University in Fort Collins, Colorado. These are all the conferences that have been held concerning graph theory in 1970 and 1971.

Sincerely,

M. Doob.

MD/ge.  
Enc.





30.8.71

Mr. M.Doob  
The University of Manitoba  
Winnipeg, Canada

17

Dear Sir,

Thank you very much for your kind letter of 23rd August.  
The papers forwarded by you are very interesting and useful in my further work. I am very grateful for your congratulations and for the data submitted to me.

Unfortunately a copy of the thesis cannot be sent to you. The thesis is in serbo-croatian, which you, probably do not understand. The English version is made only in three copies for the use of the Printing House. I hope that in two months, at latest, the thesis will be published in English, so that at that time you will be receiving it.

Hoping that our cooperation will continue, I remain, Sir,

Yours Sincerely

Dragoš Cvetković



30.8.71

Prof. Gian-Carlo Rota  
Department of Mathematics  
Massachusetts Institute of Technology  
CAMBRIDGE, Massachusetts 02139

Dear Sir,

Please find enclosed herewith the reprint of my paper entitled "Die Zahl der Wege eines Grajen", which you kindly requested from me.

Hoping that you will find my paper of interest, I remain,  
Sir,

Yours Sincerely

Dragoš Cvetković

1.9.71

Mr. Brian Alspach  
Department of Mathematics  
Simon Fraser University  
BURNABY 2, BC Canada

44

Dear Sir,

I have the pleasure to enclose herewith the requested copies of my papers "New Characterization of the Cubic Lattice Graph" and "Die Zahl der Wege Eines Grafen" which you kindly requested to be forwarded to you.

Hoping that the above papers may be useful to you, I remain, Sir,

Yours Sincerely

Dragoš Cvetković

# TECHNISCHE HOCHSCHULE ILMENAU

Sektion Mathematik, Rechentechnik und Ökonomische Kybernetik

Der Direktor

TH Ilmenau 63 Ilmenau · Postschließfach 327



Herrn  
Dr. Dragoš Cvetković

Lamartinova 44  
11.000 B e o g r a d /Yugoslavia

17

Ihre Zeichen

Ihre Nachricht vom

Bitte Abteilung mit angeben  
Unser Zeichen

63 Ilmenau

den


11 - Prof.S./Rö. 8.9.1971

Sehr geehrter Herr Dr. Cvetković !

Wie mir Herr Professor Sachs berichtete, hat Ihnen Ihre Universität ein Stipendium für einen etwa 4-wöchigen Studienaufenthalt an der Technischen Hochschule Ilmenau gewährt, um mit Herrn Professor Sachs und seinen Mitarbeitern in einen wissenschaftlichen Meinungsaustausch über Fragen der Graphentheorie zu treten.

Ich habe die Ehre, Ihnen mitzuteilen, daß Ihrem Besuch der Technischen Hochschule nichts im Wege steht, und würde mich sehr freuen, Sie bald bei uns persönlich begrüßen zu können.

Mit vorzüglicher Hochachtung

  
Professor Dr.habil. Vogel  
Sektionsdirektor

# TECHNISCHE HOCHSCHULE ILMENAU

Sektion Mathematik, Rechentchnik und Ökonomische Kybernetik

Der Direktor

TH Ilmenau · 63 Ilmenau · Postschließfach 327

## Eilboten-Einschreiben

Herrn  
Dr. Dragos Cvetković  
Lamarinova 44  
11.000 BEOGRAD /Yugoslavia

63 Ilmenau

Ihre Zeichen

Ihre Nachricht vom

Bitte Abteilung mit angeben  
Unser Zeichen

den

11 - Prof.Dr.S./Rö. 14.9.1971

Lieber Herr Dr. Cvetković!

Anbei Ihr Behelfsvisum, das Sie zur Einreise in  
die DDR berechtigt.

Ich freue mich auf Ihren Besuch!

Mit freundlichem Gruß

*Ihr*

*Hart Sachs*

Prof.Dr.habil. Sachs

Anlage

20.9.71

Dragoř Cvetković

Prof. Dr. Horst Sachs  
Am Wenzelsberg 12  
63, Ilmenau  
DDR

Dear Professor Sachs,

I acknowledge with thanks the receipt of your two letters of 7th and 8th September as well as the letter of Professor Vogel. Thank you very much for all you have done for me. I wish to inform you that my coming to Ilmenau is all right. I shall arrive there on 28th September of a few days later. In the Embassy of DDR, in Beograd, I have been told that I do not need any document more, since I Have got the visa.

Looking forward to our meeting, I remain, Sir,

Yours Sincerely

Dragoř Cvetković

20th September

Dragoř Cvetković

Professor Vogel  
Technische Hochschule Ilmenau  
Sektion Mathematik  
Rechentechnik und  
Okonomische Kybernetik  
63 Ilmenau  
DDR

Your.ref. 11-Prof  
RÖ

Dear Sir,

Thank you very much for your letter of 8.9.1971, and for your kind invitation to come to Ilmenau.

I shall probably arrive to Ilmenau on 28.9. or a few days later.

Thanking you for your kindness, I remain looking forward to our meeting.

Yours Sincerely

Dragoř Cvetković

22nd Sept. 71

Dragoš Cvetković

ČASOPIS PO PEŠTOVANI  
MATEMATIKY  
Matematický ústav  
Československé akademie  
ved v Praze  
Praha 1,  
Žitná 25

Dear Sirs,

I am enclosing herewith my paper: "On a graph theory problem of M.Koman" with the kind request to consider the possibility of its publishing in your journal.

In order to facilitate the task to your referees I am enclosing the reprints of my papers 3 and 4 . The paper 2 will be soon out of print.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Prof.

Dragoš Cvetković

Faculty of Electrical Engineering  
University of Belgrade  
Bulevar Revolucije 73  
P.O.Box 816  
Beograd-Yugoslavia

Redakce časopisů:  
**ČASOPIS PRO PĚSTOVÁNÍ  
MATEMATIKY**

CZECHOSLOVAK  
MATHEMATICAL JOURNAL

Praha 1, Žitná 25  
Tel. 226601 až 3

Věc

Č. j.:

V Praze dne September 29, 1971

Dear Sir:

thank you for submitting your paper "On a graph theory problem of M. Koman" for publication in the Časopis pro pěstování matematiky. Your paper has been sent to a referee.

Sincerely yours,

*Vlad. Džepić*



2.11.1971

Dragoř Svetković

ACTA MATHEMATICA  
Budapest 502  
Postafiók 24

Dear Sirs,

Some times ago I have sent to you my paper wntitled "Inequalities obtained on the basis of the spectrum of the graph" with my request to take into consideration for publication. You have kindly informed me on the receipt of the paper and of the appointment of referees. If the decision is already taken please let me know whether the paper was accepted for publication. At the same time I am most kindly asking you to correct a technical error in my manuscript. At the top of page three, it is written:

it shoud be:

Thanking you in advance for your kindness, I remain,

Yours Sincerely

Dragoř Cvetković

Dragoš Cvetković  
Lamartinova 44  
Beograd, Yugoslavia

MATHEMATICAL REVIEWS  
416 Fourth Street, Ann Arbor  
MICHIGAN 48103, USA

10th November 197

Dear Sirs,

According to the advice and recommendation of Professor Horst Sachs (Ilmenau, DDR), whom I recently paid a visit, I am writing to you with a kind request to accept me as a referee. I am dealing with graph theory and recently I defended the Doctorate Thesis entitled "Graphs and their spectra". I would like to review the papers on graph theory and particularly those related to matrices, i.e. their eigenvalues. I am able to read papers in English, German and Russian.

Looking forward with great interest to your reply,

Yours Sincerely

Dragoš Cvetković

# TECHNISCHE HOCHSCHULE ILMENAU

Sektion Mathematik, Rechentechnik und Ökonomische Kybernetik

DDR TH Ilmenau · 63 Ilmenau · Postschließfach 327

Herrn  
Dr. Dragoš Cvetković  
11000 B e o g r a d  
Lamartinova 44/ SR Jugoslawien

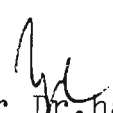
Ihre Zeichen Ihre Nachricht vom Ihre Zeichen 63 Ilmenau  
Bitte Abteilung mit angeben  
Unsere Zeichen

11 - Prof. Dr. V./Rö. 15.11.71

Lieber Herr Dr. Cvetković !

Für Ihre Nachricht, daß Sie nach Ihrem Aufenthalt in Ilmenau gut zu Hause angekommen sind, danke ich Ihnen sehr herzlich. Ich darf Ihnen im Namen aller Sektionsangehörigen, durch die Sie während Ihres Aufenthaltes betreut wurden, versichern, daß dieses alles von unserer Seite sehr gern geschehen ist.

Mit herzlichem Gruß

  
Professor Dr. habil. Vogel  
Sektionsdirektor

dzi 1687-E-V2-11-ScG10-70

Drahtwort:  
TH Ilmenau

Fernruf:  
Ilmenau 591/541  
App.

Bank:  
IHB Ilmenau 4761-22-127032  
Postscheckkonto Erfurt 134 50

Fernschreiber:  
Teha Ilm 62 84 23

Sofubi, 6.12.71

Kreji Kolega Luthovic,

Schwarzjäger beim na basz; krajici; i pisina

Profesoru na i profesor Luthovicu taku  
skraciti. To je knjiga tako kao Thompson i u tako  
cijenjen skitku!

U ovom trenutku malo vremena, ja ću knjigu skratiti.  
nije pregladati i ako se skrate, napisao bih o nj  
pikar na "Yasnik Matematiki" (matem. časak  
na ištebe na li de s time sigurno).

Uzi cijji profesor profesor Luthovicu i Luthovicu  
Kolegama,

Kostadin Vuk

Matematika

ODELJENJE ZA MATEMATIKU  
MATEMATIČKOG INSTITUTA

PETAK, 10. decembra 1971. god. u 18<sup>15</sup> časova

1. D.M.CVETKOVIĆ- J.GUTMAN: "O algebarskoj višestrukosti broja nula u spektru bihromatskog grafa"
2. A.R.AMIR - MOÉZ - On the arguments of proper values of normal and unitary, transformations  
(referent P.Miličić)
3. Ž.Mijajlović - O jednoj jednačini u kategorijama.

Upravnik Odeljenja  
Prof. Dj.Kurepa

REZIME:

1. Ispituje se veza između strukture bihromatskih grafova i višestrukosti broja nula u njihovom spektru .

THE UNIVERSITY OF MICHIGAN  
DEPARTMENT OF MATHEMATICS  
ANN ARBOR, MICHIGAN 48104

December 17, 1971

Dr. Dragoš Cvetković  
Lamartinova 44  
11,000 Beograd, Yugoslavia

Dear Dr. Cvetkovic:

Enclosed is a paper which our mutual friend, Professor Sachs, asked me to send you. Please send me your papers on this subject which are written in English. It would be a pleasure to visit you in Beograd, especially since I have not been in your country as yet!

Yours sincerely,



Frank Harary  
Professor of Mathematics

jj

Prof.

Dragoš Cvetković

Faculty of Electrical Engineering  
University of Belgrade  
Bulvar Revolucije 73  
P.O.B. 816  
Beograd-Yugoslavia

Redakce časopisů:  
**ČASOPIS PRO PĚSTOVÁNÍ  
MATEMATIKY**  
CZECHOSLOVAK  
MATHEMATICAL JOURNAL  
Praha 1, Žitná 25  
Tel. 226601 až 3

Věc

Č. j.:

V Praze dne January 7, 1972

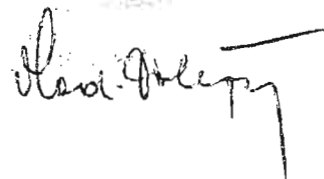
Dear Sir:

We have the pleasure of informing you that your paper "On a graph theory problem of M. Koman" has been recommended for publication in our Journal by a referee. We shall inform you as soon as possible in which number it will be published.

To be able to pass your manuscript to the printer, we desire to clear up one question of English. It seems to us that the term "path" is more usual in the theory of graphs than the word "walk" used by yourself.

Looking forward to your reply,

Sincerely yours,



Frank Harary  
The University of Michigan  
Department of Mathematics  
Ann Arbor, Michigan 48104

10th January 1972

Dear Sir,

Thank you very much for your letter of 17.12.1971. The paper which you sent to me and some references therefrom are very interesting for me, because I am studying the graph spectra.

I am enclosing herewith my papers related to this topic as well as an unpublished paper. My Dissertation entitled "Graphs and their spectra" is in print. It will soon be out of print and I will take the liberty to send it to you, since it is in relation to some papers of yours.

I am pleasantly surprised and honoured by your wish to visit Beograd and to meet me. Having in view that some other Yugoslav mathematicians would like to meet you and to hear you, I have informed Matematički institut (Mathematical Institute) on your intention to come. Mathematical Institute could send you an invitation for a short visit to Beograd, during which you would deliver a few lectures. The fees for the lectures would be sufficient for a pleasant stay in Beograd. If the above is convenient to you, please let me know, and I would see to it that an official invitation is sent to you. It would be desirable that your coming does not take place in July and August, because those are holiday months and a lot of people are out of Beograd. For an eventual longer stay, when the travelling charges would be covered, there is a principle possibility, but the procedures are considerably greater.

I wish to draw your attention to the fact that Mathematical Institute, Beograd, publishes two mathematical journals, and the published papers are paid for. If you send some of your papers I am sure it will be gladly accepted for publication.

Hoping to meet you soon in Beograd, I remain,

Yours Sincerely

Dragoš Cvetković



EDGAR HEILBRONNER  
Laboratorium für organische Chemie  
der Eidg. Technischen Hochschule,  
Z U R I C H

10th January 1972

Dear Sir,

I take the liberty to send you enclosed herewith the paper entitled: "The algebraic multiplicity of the number zero in the spectrum of a bipartite graph", relevant to the connection between Hückel's theory and theory of graph spectra, hoping that you will find it of interest.

Ivan Gutman is a chemist with the Institute "Rudjer Bošković", Zagreb, and he is dealing with Hückel's theory. I am a mathematician with the Faculty of Electrical Engineering, working on graph theory, especially graph spectra.

I would appreciate to hear your opinion on the enclosed paper and even more your opinion on the possibility of cooperation between chemists and mathematicians in relation to the problem treated in the paper.

With kind regards,

Yours Sincerely

Dragoš Cvetković

REDAKCE ČASOPISU  
ČASOPIS PRO PEŠSTOVANI  
MATEMATIKY  
CZECHOSLOVAK MATHEMATICAL JOURNAL  
Praha 1, Žitna 25

14th January 1972

Dear Sirs,

Thank you very much for your letter of 7.1.1972. I am very glad that my paper "On a graph theory problem of M.Koman" has been accepted for publication in your journal.

I am ready to accept your suggestion to substitute the word "walk" by "path", but I wish to say that in previous papers I, too, used the word "path", and few remarks were made on it. According to these remarks "Path" would mean "sequence of edges without repetition". I personally think that both words are possible, but the final decision is on you.

With kind regards,

Yours Sincerely

Dragoš Cvetković

## O B A V E Š T E N J E

Pri Katedri za matematiku na Elektrotehničkom fakultetu u Beogradu formira se grupa matematičara (mogućno i inženjera i dr.) za istraživanja na području teorije grafova. U vezi ovoga pozivaju se mlađji matematičari i inženjeri koje privlači kombinatorna matematika da se priključe ovoj grupi.

Teorija grafova je u poslednjih desetak godina doživela vidan razvoj. Karakteristika ove teorije, koja se inače mnogo primenjuje u raznim disciplinama, je nepostojanje dovoljno opštih metoda za rešavanje njenih problema. Stoga postoji veliki broj otvorenih problema najrazličitijeg stepena složenosti. U literaturi se i dalje postavljaju novi problemi.

Grupom bi rukovodio dr Dragoš Cvetković. Odredjeni preduslovi za početak rada ove grupe postoje: prikupljena je literatura, evidentiran je odredjen broj problema pogodnih za rešavanje i dr. Zainteresovani mogu da se jave D Cvetkoviću svakog petka od 9-10. časova na Elektrotehničkom fakultetu u Beogradu, Bulevar revolucije 73, soba 99.

U grupu se izuzetno mogu uključiti i odlični studenti starijih godina studija

Beograd, 21. I. 1972. god.

Šef Katedre za matematiku  
Dr Dragoslav Mitrinović, s. r.

Izdavačko preduzeće

"Vuk Karadžić"

Redakcija - Glavni urednik

Poštovana drugarice urednik,

Napisao sam knjigu čiji je radni naslov "Zanimljiva matematika - Preferans". Umesto objašnjenja šaljem Vam kopiju predgovora za knjigu.

Napominjem samo da je knjiga ozbiljnog karaktera i da predstavlja svojevrstan uvod u matematičke discipline o kojima je reč u predgovoru. Međutim, s obzirom na popularnost preferansa i činjenicu da je knjiga pisana za široki krug čitalaca, ne sumnjam u komercijalni uspeh knjige.

Rukopis je pročitao jedan profesor Univerziteta /matematičar/, koji je spreman da napiše recenziju. Naravno, mogu se odrediti i drugi recenzenti.

Ukoliko je Vaše preduzeće zainteresovano za objavljivanje ove knjige, molim Vas da me obavestite radi daljeg dogovora.

Pozdravlja Vas

dr Dragoš Cvetković  
asistent Elektrotehničkog fak.  
11000 Beograd, Lamartinova 44,  
telefon 437-263

Beograd, 24.1.1972.

MATHEMATICAL REVIEWS  
UNIVERSITY OF MICHIGAN  
1315 HILL  
ANN ARBOR, MICH. 48104, U. S. A.

February 18, 1972

Dear Dr. Cvetkovic:

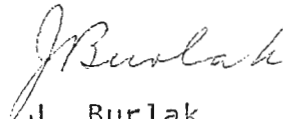
Thank you for your reply card informing us of your reviewing interests and language skills. I can assure you that both are very welcome to MATHEMATICAL REVIEWS. On behalf of our Editorial Board, it is a pleasure to welcome you to our staff of reviewers.

By a decision of the Board of Trustees of the American Mathematical Society, your privileges as a reviewer will include a free subscription to MATHEMATICAL REVIEWS, beginning with Volume 43. The volume of reviewing is such that most reviewers feel that they amply earn their subscription privileges, and the editors of MATHEMATICAL REVIEWS would agree. In truth, we could not afford to buy the expert services that are volunteered by our reviewers.

A copy of our guide for reviewers is enclosed. Two points worthy of reiteration are objectivity and promptness. A word about our method of distributing articles for review, and its relation to your willingness to review one per month, might be helpful. Actually, the only figure we can regulate is the number of items in your hands at a given time. This might on occasion, run as high as 4 or 5, but if you return reviews at the rate of one per month, we consider that the system is running smoothly. On the other hand, if you return four reviews all at one time, we might, unless otherwise instructed by you, quickly fill you up again with four new articles. Hence, it is up to you to implement the one per month rate, our files are unresponsive to the rate at which you return reviews (unless, of course, you are excessively slow).

Please keep us up-to-date on your address and your reviewing preferences. When it appears to you that other duties may temporarily limit the volume of reviews that you can handle, please let us know so that we can limit the flow of material to you. We welcome questions, suggestions, and complaints, in the belief that only in this way can our collaboration with you be effective.

Sincerely yours,



J. Burlak  
Executive Editor

JB:ds  
Enclosures

Dragoř Cvetković

Prof. Frank Harary

THE UNIVERSITY OF MICHIGAN  
Department of Mathematics  
Ann Arbor, Michigan 48104

Dear Professor Harary,

Thank you very much for your letter of 15.3.1972.  
I am very sorry to learn that you cannot come to Yugoslavia  
this year.

The paper entitled "On the reconstruction of  
countable forests" I conveyed to the Editorial Board of the  
Journal "Publications de l'Institut Mathématique". They will  
not confirm to you the receipt of the paper, since I am doing it,  
but they will write to you once the paper is accepted for publi-  
cation. The Journal's address is: Rédaction des Publications de  
l'Institut Mathématique", Knez Mihailova 35, 11000 Beograd, You-  
goslavie.

Unfortunately, your letter of 27.1.72 did not  
reach me, probably it got lost. I would appreciate, provided  
you have a copy, to forward it to me.

With kind regards,

Yours Sincerely

Dragoř Cvetković

THE UNIVERSITY OF MICHIGAN  
DEPARTMENT OF MATHEMATICS  
ANN ARBOR, MICHIGAN 48104

March 15, 1972

Dr. Dragos Cvetkovic  
Lamartinova 44  
11000 Beograd  
Yugoslavia

Dear Dr. Cvetkovic:

Further to my letter to you of January 27, I am delighted to be able to enclose a manuscript entitled "On the reconstruction of countable forests". This was written jointly with two of my students, Mr. Schwenk and Mr. Scott.

Please let me know whether you find this paper acceptable for publication, and if so, kindly send me the exact full name of the mathematical journal in which it will appear.

I am extremely sorry that circumstances will not permit me to visit Beograd and meet you this coming June. However I do hope to be able to do so during June of 1973.

By the way, I was very pleased to study your paper on cospectral graphs and I congratulate you on your results.

Yours sincerely,



Frank Harary  
Professor of Mathematics

jj

cc: Mr. Schwenk, Mr. Scott

1972  
948/2  
21. II. 1972 g.

BEGRAD, Knez Mihailova 55  
Telefon 323-423

15/71

Na osnovu odluke Načnog veća Matematičkog instituta  
sa 64. sednice od 21. II. 1972 godine a u smislu  
člana 83, 89, stav 3, 94, stav 6 Statuta Matematičkog insti-  
tuta, zaključuje se

#### S P O R A Z U M

između Matematičkog instituta u Beogradu (u daljem tekstu:  
Institut) sa jedno strane i Dr Dragoš Cvetković  
asistent Elektrotehničkog fakulteta, sa stanom u Beogradu  
Lamartinova 14.

U daljem tekstu: naučni radnik) sa druge strane za rad na  
temi

#### GRAFOVI I NJIHOVI SPEKTRI

3. Naučni radnik se obavezuje da će raditi po programu  
naučnog istraživanja Instituta, a posebno na rešavanju prob-  
lema iz spektralnog računa, koja obuhvata:

Spektar grafa se definiše kao spektar matrice susedstva  
grafa. Tema obuhvata izučavanje veze između strukturnih i spektral-  
nih osobina grafova kao i dobijanje, pomoću spektara, iskaza o struk-  
turi grafova



2. O svom radu po ovoj temi naučni radnik će referisati najmanje dva puta godišnje od čega bar je jedan u u Matematičkom odeljenju

bilo da se sam prijavi za izlaganje, bilo da ga pozove rukovodilac radne jedinice Instituta.

Krajem isteka roka sporazuma naučni radnik će, ako nije dao originalan prilog, pripremiti ekspoziciju o problemu koji je obrađivao za štampu i predati rukopise Institutu.

Ako naučni radnik u roku od godinu dana od dana potpisivanja sporazuma da naučni prilog iz dogovorene problematike, koji će se objaviti u publikacijama Instituta, ili drugim naučnim časopisima, smatra se da je izvršio svoje obaveze prema Institutu u pogledu naučnog rada, nezavisno od prethodnog stava.

Naučni radnik koji želi da svoj rad objavi u publikacijama van Instituta, trećiće saglasnost Naučnog veća s tim da u f u s n o t i naznači da je rad radjen u Institutu a po negovom objavljivanju predaće Institutu 5 separata.

3. Lični dohodak za rad i rezultate rada naučnom radniku će se isplaćivati prema Pravilniku o raspodeli sredstava za lične dohotke Instituta.

4. Ako naučni radnik samovoljno prestane da radi na temi pre isteka sporazumnog roka, Institut ima pravo na naknadnu eventualne štete putem redovnog suda, ako je šteta nastala kao posledica samovoljnog prekida rada na određjenom zadatku.

5. Ovaj sporazum koji je izradjen u t r i ravnoglasna primerka, zaključen je i potpisan u Beogradu od 1. marta 1972. do 28. februara 1973. godine.

Tri primerka sporazuma zadržava Institut, a četiri se uručuje naučnom radniku.

NAUČNI RADNIK:

Uwe Kowitz  
(Potpis)

Kamontjeva 114  
(adresa stana)

Telefon:

DIREKTOR INSTITUTA  
Dr Tatomir Andjelić

Tatomir Andjelić

Dragoš Cvetković

Prof. Frank Harary  
• The University of Michigan  
Department of Mathematics  
Ann Arbor, Michigan 48104

Dear Professor Harary,

Thank you for your letter of 10.4.1972. I will endeavour, as far as I can, to see to the organization of your coming to Yugoslavia next year.

I am enclosing herewith a copy of my Doctorate Dissertation which is just out of print.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Dragoš Cvetković

Michael Doob  
Department of Mathematics  
The University of Manitoba  
Winnipeg- Canada

Dear Sir,

I have received your consignment containing your two papers.  
Thanks a lot.

Please find enclosed herewith a copy of my Doctorate Thesis  
"Graphs and their spectra" which is finally out of print, and  
another paper of mine.

I owe you an apology for having promised you six or more  
months ago to send you the Dissertation. The delay in publishing  
was due to some technical omissions in another Dissertation, which  
was published together with mine in the same volume of our journal  
"Publikacije". No copy of my dissertation in English was availa-  
ble even a few days ago.

I hope that we will keep on exchanging papers. I would ask you,  
to indicate to me, provided you consider that my literature on  
graph spectra is incomplete, references missing. I would also  
appreciate any other information or remark regarding my Disser-  
tation.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Dragoš Cvetković

S.S. Shrikhande  
Department of Mathematics  
University of Bombay 32  
India

Dear Sir,

I take the liberty to send you a copy of my Dissertation "Graphs and their spectra" hoping that you may find it of interest since it is in relation to your papers.

With kind regards,

Yours Sincerely

Dragoš Cvetković

24.4.72

Dragoš Cvetković

Allan Hoffman  
IBM Tomas J. Wattson Research Center  
P.O.Box 218  
Yorktown Heights  
New York, USA

Dear Sir,

I take the liberty to send you a copy of my Dissertation "Graphs and their spectra" hoping that you may find it of interest since it is in connection with your papers.

I would kindly ask you to send me, if it is possible, a copy of your papers (47) and (48) - numbers referring to those from my Dissertation. I would appreciate receiving your other papers related to graph theory and which were not quoted in my Dissertation, except the paper "-1- 2" which I already have.

Thanking you in advance,

Yours Sincerely

Dragoš Cvetković

Dragoš Cvetković

Mr.Lathar Collatz  
Eulenkrugstr. 84  
• 2000 Hamburg-Volksdorf 1  
BR Deutschland

Dear Mr. Collatz,

Please find enclosed a copy of my Doctorate Thesis which is just out of print.

I take this opportunity to thank you for reading my papers as well as for your favourable opinion supplied to Professor Mitrinović regarding them.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Dragoš Cvetković

J.W.Moon  
Department of Mathematics  
University of Alberta  
Edmonton, Alta  
Canada

Dear Mr. Moon,

Thank you very much for your fine reviews on my papers in various reviews.

I am enclosing herewith a copy of my Doctorate Dissertation which is just out of print, hoping that you may find it of interest.

I have seen in Mathematical Review that you had published a monograph on determination of the number of trees. Since I am very interested in that topic I take the liberty to ask you, most kindly to send me a copy, if it is possible, of your book. Our Mathematical Library, through a Yugoslav importing enterprise has already placed the order for the book of yours but the delivery is uncertain and probably will occur with great delay. May be it is possible, now, or any time in future, to repay you for your good turn.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Dragoř Cvetković

19.5.72

Mr. Abbe Mowshowitz  
Department of Computer Science  
University of British Columbia  
Vancouver 8,  
British Columbia, Canada

Dear Sir,

I take the liberty to send you a copy of my Doctorate Thesis which recently went out of print, hoping that you may find it of interest since it is related to your papers.

If you have any paper of yours dealing with graph spectra (except for the one from J. Combinatorial Theory 12(B), 177-193 (1972) which I already have) please forward it to me.

With kind regards,

Yours Sincerely

Dragoř Cvetković





**Bell Laboratories**

600 Mountain Avenue  
Murray Hill, New Jersey 07974  
Phone (201) 582-3000

AIR MAIL

May 23, 1972

Dr. M. Dragoš  
Cvetkovic  
Department of Electrical Engineering  
University of Belgrade  
YUGOSLAVIA

Dear Dr. Dragoš:

I would be very grateful if you would send me  
a copy of your interesting paper entitled, "Graphs and  
Their Spectra", (1971).

Thank you.

Sincerely yours,

R. L. Graham

MH-1216-RLG-jh

CENTRO INTERNAZIONALE MATEMATICO ESTIVO (C.I.M.E.)  
(INTERNATIONAL MATHEMATICAL SUMMER CENTER)

Firenze, May 31, 1972

Dear Dr. Dragos Cvethovic

I am pleased to inform you that the Scientific Committee accepted your application to attend the 2<sup>nd</sup> CIME Session of 1972.

Courses will start on June 19, at 9 a.m. and will end on June 27.

Please let me know whether you need assistance from the Secretariat for lodging.

Sincerely yours,



Roberto Conti  
Secretary, CIME

Dr. Dragos Cvethovic  
Institut Mathématique  
Knez Mihailova 35  
11000 Beograd (Yougoslavie)

Dr. Jean Doyen,  
Dept. Mathematics  
Universite Libre  
Glaverbel  
166 Chaussée de la Hulpe  
Bruxelles 17, Belgique

Dear Sir,

On the suggestion of Professor J.J. Seidel I take the liberty to send you enclosed herewith a copy of my Doctorate Dissertation entitled "Graphs and their spectra", hoping that you may find it of interest.

With kind regards,

Yours Sincerely

Dragoš Cvetković

Home address:  
Lamartinova 44  
11.000 Beograd  
Yugoslavia

Professor Donald Higman  
Dept. Mathematics  
University of Michigan  
Ann Arbor USA

Dear Sir,

On the suggestion of Professor J.J. Seidel  
I take the liberty to send you enclosed herewith a copy  
of my Doctorate Dissertation entitled "Graphs and their  
spectra", hoping that you will find it of interest.

With kind regards

Sincerely Yours

Dragoš Cvetković

Home address:  
Lamartinova 44  
11.000 Beograd

2.8. 72

Dragoř Cvetković

Mr. R.L.Graham  
Bell Laboratories  
600 Mountain Avenue  
Murray Hill, N.J. 07974

Dear Sir,

Please find enclosed herewith a copy of my thesis  
"Graphs and their spectra".

Thanking you for the interest shown in my work,  
I remain, Sir,

Yours Sincerely

Dragoř Cvetković

EDGAR HEILBRONNER  
Laboratorium für organische Chemie  
der Eidg. Technischen Hochschule  
ZURICH

Dear Sir,

On 10th January I sent you a paper entitled " The algebraic multiplicity of the number zero in the spectrum of a bipartite graph" relevant to the connection between Hückel's theory and theory of graph spectra, asking for your opinion on the paper.

Since up to now I did not receive any reply I am afraid that the letter may be got lost or perhaps that I gave you a wrong address of mine, which occurred to a letter sent the same day as the one to you.

My home address is: Cvetković Dragoš, 11.000, Lamar-  
tinova 44, Yugoslavia, or, my Faculty address:POB.816.

With kind regards,

Yours Sincerely

Dragoš Cvetković

*Moon*

DEPARTMENT OF MATHEMATICS  
THE UNIVERSITY OF ALBERTA  
EDMONTON 7, ALBERTA, CANADA

AIR MAIL



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*Dragoš Cvethković*  
*Faculty of Electrical Engineering*  
*University of Belgrade*  
*Bulevar Revolucije, 73*  
*P.O. Box 816*  
*BEOGRAD, Yugoslavia*

*70*



# mble

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TELEPH. 73.41.90 - 73.41.99

YOUR REF.:

OUR REF.: JMG/AS

BRUSSELS

Dr Dragoš Cvetković  
Faculty of Electrical Engrg  
University of Belgrade  
Bulevar Revolucije 73  
P. O. Box 816  
BEOGRAD (YUGOSLAVIA)

June 6, 1972


Dear Dr Cvetković,

I acknowledge with thanks the receipt of your dissertation on "Graphs and their Spectra", which I will read with great interest.

By separate mail, I am sending some reprints, in which you might be interested.

With regards,

Yours sincerely,



J. M. Goethals



7 June, 1972

Dear Dr. Coetkovic

Thank you very much for the copy of your Dissertation which arrived today. I am very interested in graphs from the point of view of group theory and find your work and references very interesting.

Sincerely yours  
Donald Heyman

100  
copy of photo  
image of...  
Ann Arbor, Mich 48104  
USA



Dr Dragoš Cvetković  
Lamartínova 44  
11.000 Beograd,  
YUGOSLAVIA.

AEROGRAMME • VIA AIR MAIL • PAR AVION

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**Bell Laboratories**

600 Mountain Avenue  
Murray Hill, New Jersey 07974  
Phone (201) 582-3000

June 23, 1972

Dr. Dragoš M. Cvetković  
Department of Electrical Engineering  
University of Belgrade  
Belgrade  
YUGOSLAVIA

Dear Dr. Cvetković:

I would greatly appreciate receiving a copy of  
your very interesting paper on "Graphs and Their Spectra".

Thank you.

Yours sincerely,

N. J. A. Sloane

MH-1216-NJAS-1k

29.6.72

D.Cvetković

J.W.MOON  
Department of Mathematics  
University of Alberta  
Edmonton, Alta  
Canada

Dear Professor Moon,

Thank you very much for your kind forwarding to me  
of your book "Counting labelled trees".

With the kindest regards,

Yours Sincerely

D.Cvetković

29.6.72

D.M.Cvetković

J.SEDLAČEK  
Matematický Ústav ČSAV  
Žitná 25,  
Praha 1  
Chechoslovakia

Dear Sir,

Please find enclosed herewith my paper entitled:  
"The spectral method for determining the number of trees".

Thanking you for the interest shown in my paper,  
I remain, Sir,

Yours Sincerely

D.Cvetković

D.Cvetković

Dr. J.M. GOETHALS  
M.B.L.E. Research Laboratory  
2 Rue van Becelaire  
Bruxelles 17  
BELGIQUE

Dear Dr. Goethals,

Thank you very much for the papers which you kindly  
despatched to me.

With kind regards,

Yours Sincerely

D.Cvetković

D.Cvetković

N.J.A.Sloane  
Bell Laboratories  
600 Mountain Avenue  
• Murray Hill  
New Jersey 07974

Dear Sir,

Please find enclosed herewith a copy of my  
Dr. Thesis "Graphs and their spectra".

Thank you very much for the interest shown in  
my paper,

Yours Sincerely

D.Cvetković

Mr. E. Nosal  
Department of Math.  
University of Calgary  
Calgary, Alta  
Canada

Dear Sir,

I am most kindly asking you to send me a copy of your paper entitled "On the number of spanning trees of finite graphs", which appeared in Calgary Univ. Res. Paper 95 (1970).

Thanking you in advance, I remain,

Yours Sincerely

Dragoš Cvetković



Prof. Clarence King  
Department of Math.  
University of W. Indies  
Kingston. Jamaica

Dear Prof. King,

I am most kindly asking you to send me a copy of your paper entitled "Characteristic polynomials of 7-point graphs", which appeared in Scientific Report VWI/CC6, University of W. Indies, Kingston, in 1967.

Thanking you in advance, I remain,

Yours Sincerely

Dragoš Cvetković

Dragoš Cvetković

Professor H. Hosoya  
Department of Chemistry  
Ochanomizu University  
Bunkyo-ku, Tokyo 112,  
Japan

Dear Sir,

I am most kindly asking you to send me the copies of the following papers of yours which appeared in:

1. Bull. Chem. Soc. Japan, 44, 2332 (1971)
2. Natural Science Report of Ochanomizu Univ. (Tokyo) 22, 39 (1971) (written with Mizutani K. and Kawasaki, K.)
3. Natural Science Report of Ochanomizu Univ. (Tokyo) 22, 181 (1972) (written with Kawasaki K. and Mizutani K.)

Thanking you in advance for your kindness, I am Sir,

Yours Sincerely

Dragoš Cvetković

# MATHEMATICS IN SCIENCE AND ENGINEERING

A Series of Monographs and Textbooks

*Editor:*

RICHARD BELLMAN  
Departments of Mathematics and Engineering  
University of Southern California  
University Park  
Los Angeles, California 90008

*Publishers:*

ACADEMIC PRESS INC.  
111 Fifth Avenue  
New York 3, New York

47

July 31, 1972

Dr. Dragoš M. Cvetković  
Department of Electrical Engineering  
University of Belgrade  
Belgrade, YUGOSLAVIA

Dear Dr. Cvetković:

I noted with great interest your paper "Graphs and Their Spectra." Have you given any thought to extending these results and collecting them in book form? If so, I would be glad to consider it for my Academic Press series.

Cordially,

  
Richard Bellman

RB:rk

cc: Terrence J. Toohy



FACULTY OF ARTS AND SCIENCE / DEPARTMENT OF MATHEMATICS, STATISTICS AND COMPUTING SCIENCE

Eva Rosal  
Dept. of Mathematics, Statistics and Computing Science  
University of Calgary  
Calgary 44, Alberta, Canada

Calgary, 9.8.1972

Dr. Dragoš Cvetković  
Faculty of Electrical Engineering  
University of Belgrade  
Belgrade - Yugoslavia

Dear Sir,

Thank you for your letter. Together with my research paper I am sending to you one copy of my 40c thesis since some parts could be of some interest to you. I was working on a problem of determining the maximal and minimal number of spanning trees of a regular graph (see page 36) but I obtained only an estimate (Theorem 3.4.1, page 37). Few other problems and remarks you will find on the page 47-47.

Yours sincerely  
Eva Rosal

29.8.72

Dragoš Cvetković

Prof. R. Bellman  
Mathematics in Science and Engineering  
Department of Mathematics and Engineering  
University Park  
Los Angeles California 90008

Dear Professor Bellman,

Thank you very much for your letter of 31.7.72, which really made me happy. I apologize for my delayed reply, because I was absent for a while from Beograd.

I am still working on graph spectra and would like to have a book published on that matter. I shall soon write to you in detail.

With kind regards,

Yours Sincerely

Dragoš Cvetković

29.8. 72

Dragoš Cvetković

Mrs. Eva Nosal  
The University of Calgary  
Calgary 44  
Alberta, Canada  
Area Code 403

Dear Mrs. Nosal,

Thank you very much for your letter of 9.8.72 and your papers which you kindly sent to me. I am very interested in them because I am dealing with graph spectra too. It seems that we have got quite a lot of common ideas.

I am enclosing herewith a copy of my Thesis "Graphs and their spectra" as well as a paper "The Spectral method for determining the number of trees".

If you have other papers on graph spectra, I would like to get them.

With kind regards,

Yours Sincerely

D.Cvetković

Dragoš Cvetković

Mrs. Eva Nosal  
The University of Calgary  
Calgary 44  
Alberta, Canada  
A.C. 403

Dear Mrs. Nosal,

Thank you very much for your letter of 9.8.72 and your papers which you kindly sent to me. I am very interested in them because I am dealing with graph spectra too. It seems that we have got quite a lot of common ideas.

I am sending by a separate mail a copy of my Thesis "Graphs and their spectra" together with a paper "The Spectral method for determining the number of trees",

If you have other papers on graph spectra, I would like to get them.

With kind regards,

Yours Sincerely

D.Cvetković

STAMPE - PRINTED MATTERS

CENTRO INTERNAZIONALE MATEMATICO ESTIVO (C.I.M.E.)  
INTERNATIONAL MATHEMATICAL SUMMER CENTER

Summer Session 1972 on  
"FINITE GEOMETRIC STRUCTURES AND THEIR APPLICATIONS"

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(.....)



# CENTRO INTERNAZIONALE MATEMATICO ESTIVO (C.I.M.E.)

## INTERNATIONAL MATHEMATICAL SUMMER CENTER

### "FINITE GEOMETRIC STRUCTURES AND THEIR APPLICATIONS"

is the subject of the second C.I.M.E. Session 1972 which will take place, under the Scientific Direction of Professor A. Barlotti (of the University of Perugia, Italy) in Bressanone (Bolzano, Italy) from June 18th (arrival in the afternoon) to June 27th (departure in the afternoon).

The session will essentially consist of the following

#### *Main Courses*

a) R. C. BOSE (University of Colorado, U.S.A.); 8 lectures in English on:

##### *Graphs and Designs.*

1. *Balanced Incomplete Block (BIB) Designs.*

Relations between parameters. Fishers inequality. Resolvable BIB designs and the inequality satisfied by the parameters. Affine resolvable designs. Methods of construction.

2. *Group Divisible (GD) Designs.*

Relations between parameters. Classification into singular, semi-regular and regular GD designs. Combinatorial properties of each class. Methods of construction.

3. *Partially Balanced Incomplete Block (PBIB) Designs.*

Partially balanced association schemes. Relations between parameters. The algebra of association matrices. Important classes of association schemes. Examples of PBIB designs.

4, 5, 6. *Strongly Regular Graphs, Partial Geometries and the Characterization of  $T_m$  and  $L_n$  Graphs.*

Definitions. The graph of a partial geometry. Pseudo geometric graphs. Conditions under which a pseudo geometric graph is geometric.

Theorems of Connor, Bruck, Shrikhande, Hoffman, Bose, Laskar, Dowling and Ray-Chaudhuri on characterization of  $T_m$  and  $L_n$  graphs. Detailed consideration of  $T_2$  graphs. Seidel switch theory.

7.  *$(v, k, \lambda)$  Graphs.*

Conditions for existence and methods of construction.

8. *Embedding Theorems and Generalized Quadrangles.*

Embedding theorems of Dickey, Bose and Shrikhande. Pseudo-geometric and Geometric graphs of type  $(q^2 + 1, q + 1, 1)$ .

Generalized Quadrangles. Theorems of Payne and Hall.

##### *Basic References:*

- 1 H. B. MANN, *Analysis and Design of Experiments*. Dover Publications, Inc. New York, 1943.
- 2 H. J. RYSER, *Combinatorial Mathematics*, Published by the Mathematical Association of America, 1963, Distributed by John Wiley and Sons, Inc.
- 3 R. C. BOSE, *Combinatorial properties of partially balanced designs and association schemes*. Sankhya Ser. A., 25 (1963), 109-136.
- 4 R. C. BOSE, *Strongly regular graphs, partial geometries and partially balanced designs*. Pacific J. Math., 13 (1963), 389-419.

b) H. LÜNEBURG (University of Trier - Kaiserslautern, D.B.R.); 8 lectures in English on:

##### *Groups and Finite Projective Planes.*

An important part of the theory of finite projective planes is the characterization of known finite planes by their collineation groups or by subgroups of their collineation groups. Two such

characterizations will be considered in detail, namely a characterization of the Hughes-planes by the groups  $PSL(2, q)$  and a characterization of the Hall-planes by some permutation theoretical properties of their collineation groups.

*Basic References:*

- 1 G. PICKERT, *Projektive Ebenen*, Springer Verlag, 1955.
- 2 P. DEMBOWSKI, *Finite Geometries*, Springer Verlag, 1968.

c) R. H. BRUCK (University of Wisconsin, U.S.A.); 8 lectures in English on:  
*Construction of finite planes.*

^Detailed information has not yet reached us. Introduction to the subject in P. Dembowski (already quoted), Ch. 5.

Lectures notes will be published as soon as possible after the Session; participants should subscribe, during the Session, in order to get one set of notes, as soon as available, at a reduced price.

---

Those who wish to attend the Session should apply to

Prof. R. CONTI  
Secretary, C.I.M.E.  
Istituto Matematico U. DINI  
Viale Morgagni, 67/A  
50134 FIRENZE (Italy)

*not later than May 10th, 1972.*

No special application form is required.

An important consideration in the acceptance of applicants is the scientific relevance of this course to the participant's field of interest. Applicants are requested, therefore, to submit, along with their scientific curriculum and/or a letter of recommendation, a statement indicating the reason for their particular interest in this course.

Participation will not be allowed to persons who have not sent an application, nor to those whose applications have been rejected.

Each non-Italian participant, whose application has been accepted, will receive from the C.I.M.E. a contribution of Ital. Lire 50.000.

---

The lectures will be held in Bressanone, at the "Casa della Gioventù Universitaria".

Bressanone is situated in the Dolomites zone of the Alps, about 1800 ft. (600 meters) sea level at the confluence of two important highways from the Brennero and the Pusteria Valley. It is accessible either by car or rail. All the trains of the line connecting Rome to Innsbruck and Vienna stop at Bressanone.

Different accomodations, ranging from 2.500 to 4.500 Ital. Lire per person daily for a full pension, are available at the following 2nd and 3rd Cat. hotels: Excelsior, Gasser, Croce d'Oro, Chiavi d'Oro, Heiseler, Rosa d'Oro, Sole, Touring. Cheaper arrangements are also possible.

Rooms are available at the Casa della Gioventù Universitaria at the rate of 1.300 or 1.000 Ital. Lire per person for a single bed or a two bed room respectively. The Secretary of the C.I.M.E. will be glad to help participants to solve their lodging problems.



**Bell Laboratories**

600 Mountain Avenue  
Murray Hill, New Jersey 07974  
Phone (201) 582-3000

September 12, 1972

Dr. Dragos M. Cvetkovic  
University of Belgrade  
Belgrade  
YUGOSLAVIA

Dear Dr. Cvetkovic:

I am writing to request two copies of your most interesting survey on graphs and their spectra which appeared in 1971. Also, if available, I would be very happy to receive copies of your other work in this and related fields (e.g., that which is mentioned in your survey).

My interest in this area stems from the work occurring in the enclosed reprints.

Sincerely yours,

R. L. Graham

MH-1216-RLG-pb

Att.  
Reprints

26.9.72

MEAD JOHNSON LABORATORIES  
A Division of Mead Johnson & Company  
Evansville, Indiana 47721

Dear Sirs,

My physician recommended to me the acquisition of the apparatus Maxi-Myst Aerosol Unit. Please let me know whether that apparatus may be supplied by your company and what is the price. Whether the apparatus may operate well on the current of 50 Cs.

Money would be paid by a friend of mine from Los Angeles, so please supply the necessary information regarding the address of the Bank with which you are dealing. What is more convenient to you? To send the apparatus directly to me or to my friend in Los Angeles, and afterwards he would forward it to me.

Thanking you in advance for your urgent reply,

Yours Sincerely

Dragoš Cvetković

Dragoš Cvetković  
Lamartinova 44  
11.000 Beograd  
Yugoslavia

UNIVERSITY OF THE WEST INDIES

Mathematics Department

CABLE AND TELEGRAPH

"UNIVERSITY"

PHONE 76661

MOMA, KINGSTON 7

JAMAICA.



.....26th September, 1972

OUR REFERENCE

Dear Sir,

Dr. Clarence King has asked me to let you know that the paper you requested by him is no longer available. We are very sorry.

Yours sincerely,

*Ingrid Havis*

for C.A. King.

DEKANU ELEKTROTEHNIČKOG FAKULTETA

B E O G R A D

Izveštaj o učestvovanju na zasjedanju Internacionalnog letnjeg matematičkog centra

U vremenu od 18.6 - 27.6. 1972. učestvovao sam na zasjedanju Internacionalnog letnjeg matematičkog centra u Bresanoneu (Severna Italija). Putne troškove mi je platio fakultet a troškove boravka organizator.

Tema zasjedanja je bila "Konačne geometrijske strukture i njihove primene". Moj interes za ovu tematiku proističe iz činjenice što se bavim teorijom grafova, kojom je inače bila prožeta tematika zasjedanja. U okviru zasjedanja su održana tri kursa:

1. R.C. Bose: Grafovi i blok-šeme;
2. R.H. Bruck; Konstrukcija konačnih ravni
3. H. Lüneburg, Grupe i konačne projektivne ravni.

U prilogu je dat spisak učesnika zasjedanja.

U toku zasjedanja sam stupio u kontakt sa više matematičara iz raznih zemalja.

Kao zaključak, mogu da kažem da sam zadovoljan onim što sam sa stručne strane u toku zasjedanja čuo i naučio.

Beograd, 29.9.1972.

dr Dragoš Cvetković  
asist. Elektr.teh. fak.

5.10.72

Dragoš Cvetković

Professor  
Richard Bellman  
Mathematics in Science and Engineering <sup>17</sup>  
Academic Press Inc  
111 Fifth Avenue  
New York, 3, N.Y.

Dear Professor Bellman,

I am writing to you again with reference to your letter of 31.7.72, i.e. with reference to your offer to publish the book entitled "Graphs and their spectra".

I had agreed with professor Horst Sachs (Ilmenau - German Democratic Republic); a year ago, to publish such a book, both of us together. Writing of manuscript is already in course. That is why I had, naturally, prior to giving you a definitive reply, to consult Professor Sachs. Since Professor Sachs was in the meantime in the Soviet Union, it took some time to reply to you. Please accept my apology for this delayed answer.

Professor Sachs has, unfortunately, made an agreement with -German Publishing Houses to publish that book in GDR ("Deutsche Verlag der Wissenschaften", Berlin and "Teubner Verlag", Leipzig). Professor Sachs and me, we feel bound by that agreement. However, as I was informed by Prof. Sachs, both these Publishing Houses are interested in a cooperation with Academic Press and would willingly publish that book in cooperation with Academic Press. As I gathered from Prof. Sachs's letter, such a cooperation would be of economical interest to Academic Press, since the book printing could be done in GDR. In that case the book would probably be published in English, though our original intention was to write it in German. Professor Sachs and myself, we would welcome such a cooperation.

If Academic Press is interested in the above, please write to Professor Sachs who will easily convey your instructions and messages to German Publishers, since he is in touch with them. His address is as follows:

Prof. Sachs, H.  
DDR 63 Ilmenau  
Technische Hochschule  
Sektion Marök  
Am Ehrenberg, Block G.

With kind regards,

Yours Sincerely

Dragoš Cvetković

9.10.72

Dragoš Cvetković

Mr. R.L.Graham  
Bell Laboratories  
600 Mountain Avenue ,  
Murray Hill, New Jersey 07974

Dear Mr. Graham,

By a separate mail I sent you the papers which you requested.

If you have any new results relevant to graph spectra, please forward them to me.

Thanking you for the interest shown in my papers.

With kind regards,

Yours sincerely

D.Dvetković



9.10.72

D.Cvetković

Mr.Alan J.Hoffman  
Thomas J.Watson Research Center  
P.O.Box 218  
Worktown Heights,New York 10598

Dear Mr. Hoffman,

Thank you very much for your letter of 3.5.72.

I am most kindly asking you to send me the reprint of your paper on partitioning of edges of a graph, from Linear Algebra and its Applications, as well as other, new papers relevant to graph spectra.

The Journal "Linear Algebra and its Application" cannot be found in Beograd. As I am assuming that you are the editor of that Journal or that you are certainly in the Editorial Staff, please let me know the exact address of the paper so that we could subscribe to it. Is it possible to get the Journal in exchange? There are several mathematical journals published in Beograd and the possibility for an exchange exists.

I wish, by the way, to inform you that I obtained the following result:

$$(G) \frac{n}{n-r}$$

( (G) - chromatic number, n the number of vertices, the greatest eigenvalue).

With kind regards,

Yours sincerely

D.Cvetković

9.10.72

Dr.Dennis H.Rouvray  
University of the Witwatersrand,  
Johanesburg  
• Department of Chem.incl.Biochem.  
Jan Smuts Avenue,  
Johanesburg  
South Africa

Dear Dr. Dennis,

By a separate mail I sent you a copy of the paper which you requested as well as the copy of my dissertation "Graphs and their spectra" containing the survey of results which may be of interest to you. I wish to draw your attention particularly to page 30, Theorem:4.2.

Soon in Matematički Vesnik (Beograd) my paper written together with I.Gutman(Zagreb) will appear, under the title "The algebraic multiplicity of the eigenvalue zero in the spectrum of a bipartite graph". This paper is in connection with Hückel's theory of molecular orbitals.

Thanking you for the interest shown in my paper,

Yours Sincerely

D.Cvetković

# MATHEMATICS IN SCIENCE AND ENGINEERING

A Series of Monographs and Textbooks

*Editor:*

RICHARD BELLMAN  
Departments of Mathematics and Engineering  
University of Southern California  
University Park  
Los Angeles, California 90008

*Publishers:*

ACADEMIC PRESS INC.  
111 Fifth Avenue  
New York 3, New York

October 12, 1972

Professor Dragoš Cvetković  
Faculty of Electrical Engineering  
University of Belgrade  
Bulevar Revolucije, 73  
Post Office Box 816  
Beograd, YUGOSLAVIA

Dear Professor Cvetković:

I am very interested in your proposal. I have sent your letter to Terrence Toohey of Academic Press asking him to correspond with you directly concerning these matters.

Cordially,

  
Richard Bellman

RB:rk

cc: Terrence Toohey

# University of the Witwatersrand, Johannesburg



Department of Chemistry including Biochemistry  
Jan Smuts Avenue, Johannesburg, South Africa  
Telephone 724-1311 Telegrams 'University'

16th October, 1972

Dr. D.M. Cvetković  
Mathematics Department  
Faculty of Electrotechnology  
Belgrade University  
P. O. Box 816  
11001 Belgrade  
Yugoslavia.

---

Dear Dr. Cvetković,

Many thanks for your recent letter. It was very kind of you to send me your dissertation in addition to the paper I requested. I must say that both of them made extremely interesting reading for me as I am interested in largely similar problems. Although I am a chemist, I still use graph theory very often and most of my research to date has centred on the several chemical applications of graph theory. At the moment I am particularly interested in colouring problems.

Accordingly, I should be most grateful if you would send further reprints of yours, especially those which relate in any way to colouring problems. I should also very much like to see references 12 to 22 listed at the end of your dissertation.

One point I feel I should mention to you concerns your Theorem 4.2. I too have done some work in this area in a purely chemical context. I enclose a reprint of one of my papers to indicate my type of approach. The first workers to prove this theorem as far as I know were Professors Coulson and Rushbrooke in 1940. (The reference is given at the end of my reprint.) But I note that you do not include a reference to them on p. 30. I am particularly interested in their work as I have just sent a paper on this theme to the *Journal of Combinatorial Theory*.

Thanking you for your kind attention and looking forward to hearing from you soon I am,

Yours sincerely,

A handwritten signature in cursive script that reads "D. H. Rouvray".

(Dr.) D. H. Rouvray.

Mathematical Sciences Department

Thomas J. Watson Research Center  
P.O. Box 218  
Yorktown Heights, New York 10598  
914/945-3000

October 17, 1972

Dr. D. Cvetkovic  
Faculty of Electrical Engineering  
University of Belgrade  
Bulevar Revolucije, 73  
P. O. Box 816  
Beograd - Yugoslavia

Dear Dr. Cvetkovic,

Thank you for your letter of September 10. I enclose the reprint you requested and another which you may not have. I hope to be able to send you others shortly.

The Journal Linear Algebra and its Applications is published by American Elsevier, 52 Vanderbilt Avenue, New York, N. Y. 10017. The managing editor is now Professor Hans Schneider at the University of Wisconsin, Madison, Wisconsin.

I was intrigued by your new lower bound for your chromatic number, and it took me a while to prove it, and also to see that there are cases where its better than my lower bound. As you will see from the reprint, however, chromatic number and spectra are really unrelated, despite the bounds.

Instead I ask that you send me another copy of your thesis, with its marvelous bibliography as well as copies of your other work (particularly that which bears on Bose-Laskar problem)? I would be grateful.

Sincerely yours,



Alan J. Hoffman

AJH/av  
Enclosures

## IZVEŠTAJ O STUDIJSKOM PUTOVANJU

Od strane naslova dodeljena mi je stipendija za studijsko putovanje u Ilmenau (Nemačka Demokratska Republika) radi naučnog usavršavanja po temi "Grafovi i njihovi spektri". Izveštavam Vas da sam stipendiju iskoristio u vremenu od 29.9.1971. do 23.10.1971. Boravio sam na Visokoj tehničkoj školi, Ilmenau, kod prof. Sachs-a. Prof. Sachs je okupio veći broj saradnika koji se bave teorijom grafova, kako teorijski, tako i u vezi sa primenama. Studijski boravak sam proveo u stalnoj izmeni mišljenja sa prof. Sachsem i njegovim saradnicima o teoriji grafova a posebno o temi "Grafovi i njihovi spektri", koja je bila i tema moje nedavne odbranjene doktorske disertacije. Takođe sam koristio veliku zbirku separata i knjiga o teoriji grafova koja se nalazi u Ilmenau-u. Glavni rezultat posete je dogovor sa prof. Sachsem o zajedničkom pisanju monografije o spektrima grafova koja bi izašla (na nemačkom jeziku) u Nemačkoj.

Na osnovu izloženog smatram da je moj studijski boravak u Ilmenau-u bio uspešan.

Beograd 30.10.1971.

Podnosilac izveštaja :

*D. Cvetković*

Cvetković Dragoš

11000 Beograd , Lamartićeva 44

1. XI 71

*[Handwritten signature]*

NORTH-HOLLAND PUBLISHING COMPANY

AMSTERDAM-C. - TELEPHONE 223522 - P.O. BOX 3489



Amsterdam, 22 NOV 1972

Dear Author,

Enclosed are the original drawings you submitted together with your contribution for a recent North-Holland publication.

Your paper has now been published, and it is of no use to file the figures in our office whereas you may want them at a later date.

We are looking forward to a possible cooperation in the future, and remain,

yours sincerely,  
NORTH-HOLLAND PUBLISHING COMPANY

Journal: **Chem. Phys. Letters** 392  
Volume: 16/3  
Pages : 614 - 616

Cables: Nohum-Amsterdam

# University of the Witwatersrand, Johannesburg



Department of Chemistry including Biochemistry

Jan Smuts Avenue, Johannesburg, South Africa

Telephone 724-1311 Telegrams 'University'

4th December, 1972

Dr. D. Cvetković  
Mathematics Department  
Faculty of Electrotechnology  
Belgrade University  
P. O. Box 816  
11001 Belgrade  
Yugoslavia.

---

Dear Dragoš,

Many thanks for your letter of 9th October which apparently crossed with my own. I am also very grateful to you for sending several of your reprints which I found extremely interesting to read. I shall certainly have occasion to refer to them in some papers I shall be writing early in the New Year.

Your paper to appear in *Matematički Vesnik* also sounds very interesting and I would appreciate receiving a reprint from you as soon as possible. I have been working on some similar problems myself.

I hope that by now you have received a reprint of my paper on the eigenvalues of molecules having bipartite graphs. I send herewith my paper on the tripartite case which is much more difficult to solve. As you will see I give no more than a partial solution as I could not get further than this. If you are able to take this work further either in a joint publication with me or on your own I should be delighted.

We may well have the opportunity of meeting next year as it is possible that I shall be meeting Dr. Trinajstić in Yugoslavia. He has offered me a post in Zagreb which I am hoping to take up in 1974.

In conclusion I take this opportunity of sending you the compliments of the season and wishing you all the very best in the New Year.

Yours sincerely,

A handwritten signature in cursive script that reads "Dennis Rouvray".

D. H. Rouvray.



# University of Essex

Department of Chemistry  
Wivenhoe Park  
Colchester CO4 3SQ

Tel: Colchester 44144 (STD Code 020 6)  
Telegraphic address: University Colchester  
Telex: 98440 (UNILIB COLCHSTR)

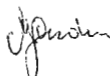
12th December, 1972.

Dr. D. Svetković,  
Lamartinova 44,  
11000 Belgrade,  
Yugoslavia.

Dear Dr. Svetković,

My friend Professor Sachs of Ilmenau has told me that you are making applications of graph theory to quantum chemistry. I would be most interested to receive any reprints of your work which you may have available. I take the opportunity of enclosing some reprints of our work here, which is concerned with the use of graph theory in pre-quantum theories of chemistry.

Yours sincerely,



M. Gordon.

Encs.

Colloquia Mathematica Soc. Janos Bolyai, North-Holland Publishing Co.,  
1970, 4, 511.

Coll. Czech. Comm., 1970, 35, 3252.

Proc. Roy. Soc. (Edin.) 1970/1, A69, 181.

J. Comb. Theory, 1971, 11, 142.

Nature, 234, 96, 1971.

Makromol. Chem., 1972, 152, 277.

Makromol. Chem., 1972, 160, 263.

Makromol. Chem., 1972, 160, 277.

22.12.72

Mr. D.H. Rouvray  
University of the Witwatersrand  
Department of Chemistry including  
Biochemistry  
Jan Smuts Avenue  
Johannesburg  
South Africa

Dear Mr. Rouvray,

Thank you very much for your letter of 4.12.72  
and for the interest which you showed in my papers.

Your paper about three-partite graphs is interesting  
and I shall certainly consider the possibilities of further de-  
velopment of ideas which are given there.

I am enclosing herewith the paper from Mat.Vesnik  
as well as another one written in cooperation with a group of  
chemists from Zagreb.

I take this opportunity to wish you all the best  
in the New Year.

Yours sincerely

Dragoš Cvetković

22.12.72

Mr. Gordon  
University of Essex  
Department of Chemistry  
Wivenhoe Park  
Colchester CO4 3SQ

Dear Professor Gordon,

Thank you very much for your kind letter of 12.12.72 and for the papers which you forwarded to me.

I am a mathematician dealing with graph theory, especially with graph spectra. A casual contact with chemists entailed a cooperation resulting in a few papers in connection with Hückel theory. I am enclosing herewith two of these papers. If you find this topic of interest you may turn to dr. N. Trinajstić (whose address is quoted in a reprint) for reprints of other papers. I am also enclosing a copy of my dissertation "Graphs and their spectra" containing the exposition of all important results about graph spectra.

With kind regards,

Yours sincerely

D. Cvetković





THE UNIVERSITY OF MANITOBA

DEPARTMENT OF COMPUTER SCIENCE

WINNIPEG, CANADA R3T 2N2

11 Jan, 1973

Dear Dr Cvethovic,

I have heard with interest of your  
Doctorate Thesis "Graphs and Their  
Spectra". I would very much like  
to receive a copy if you have  
any available, and copies of your  
related papers.

Yours Sincerely

W.D. Wallis



THE UNIVERSITY OF MANITOBA

DEPARTMENT OF MATHEMATICS AND ASTRONOMY

WINNIPEG, CANADA

January 18, 1973

Dr. Dragoš Cvetković  
Faculty of Electrical Engineering  
University of Belgrade  
Bulevar Revolucije, 73  
11000 Beograd, Yugoslavia

Dear Sir,

Thank you very much for the English copy of your dissertation. Enclosed are two preprints that I hope you may find interesting. In "Eigenvalues of a Graph and its Imbeddings", I show that given a particular graph, I can construct arbitrarily large families of nonisomorphic isospectral graphs in which each member contains the particular graph as a subgraph. This yields a plethora of PINGs. In "A Spectral Characterization of the Line Graph of a BIBD ....." The results of Hoffman which you give as Theorem 3.8 - Theorem 3.10 are generalized. I have some better results, but I haven't had time to write them in a paper yet.

I hope to be travelling with my wife and daughter to Yugoslavia early in May. Would we be able to get together at that time? I'm sure there is much we could talk about. If all goes according to plan, I will be driving from either Zurich or Vienna to Athens. Since I speak not one word in any Yugoslavian language, any information that you can give me concerning driving in Belgrade would be greatly appreciated.

Hoping to see you soon.

Sincerely yours,

Michael Doob

Dragoš Cvetković

25.1.1978

Mr. Frank Harary  
Mathematical Institute  
University of Oxford  
24-29 St. Giles  
Oxford OX 1 3LB  
England

Dear Mr. Harary,

Please find enclosed herewith a paper entitled: "Some remarks on the complement of a line graph". My associate - Simić and myself are the authors. I would appreciate knowing your opinion is the paper worth publishing. I learned that Prof. Beineke is with you, so please let him see the paper, too.

I am most thankful to you and to Mr. Schwenk for dealing with problems from some of my papers when writing the paper dedicated to the 60-th anniversary of Mr. Erdős. If you have any new results concerning graph spectra, please send them to me.

Do you have any plans concerning a visit to Yugoslavia? At the end of June the Balkan Mathematical Congress will be held.

Please convey my regards to Mr. Schwen.

Yours sincerely

D.Cvetković

26.1.1973

Mr. Norman Biggs  
Royal Holloway College  
University of London  
Englefield Green  
Surrey,  
England

Dear Mr. Biggs,

Professor J.W.Moon has in the review on my paper "The spectral method for determining the number of trees"(ZBL.221,05054) mentioned your unpublished manuscript having the similar topic (determination of the number of trees by eigenvalues of the adjacency matrix and graph). I am interested in your paper irrespective of that whether it is published or not, and I am most kindly asking you to send me a copy of it, if it is possible.

Thanking you in advance,

Yours sincerely

Dragoš Cvetković



26.1.1973

Mr. Michael Doob  
University of Manitoba  
Department of Mathematics  
Winnipeg, Canada

Dear Mr. Doob,

Thank you very much for your letter of 18.1.1973 and papers which you kindly sent to me.

I am happy to learn that you are soon coming to Beograd. It will certainly be an occasion to exchange our views on the matters in which we are both interested. I may book you a hotel room in Beograd and be at your disposal in other similar things. Please write to me about things which you are interested in.

I would appreciate receiving the full list of your papers either published or prepared for publication relevant to graph spectra. I have your paper which you sent me earlier, but I am missing data on publications where they were published.

With kind regards,

Yours sincerely

Dragoš Cvetković

# TECHNISCHE HOCHSCHULE ILMENAU

Organisationskomitee des  
XVIII. Internationalen Wissenschaftlichen Kolloquiums  
Vorsitzender

Herrn  
Dr. Dragos Cvetković

11000 Beograd  
• Lanrtinove 44

Jugoslawien

Ilmenau, Februar 1973


Sehr geehrter Autor!

Ich freue mich, daß Sie sich bereit erklärt haben, auf dem XVIII. Internationalen Wissenschaftlichen Kolloquium der Technischen Hochschule Ilmenau einen Vortrag in der Vortragsreihe 12 mit dem Thema:

Über die Zerlegung eines Graphen in ein Produkt von Graphen

zu halten und bitte Sie höflichst, den Vortrag entsprechend den beiliegenden Autorenhinweisen für die Aufnahme in den Tagungsbericht verbindlich bis zum 15. April 1973 (Eingangsdatum bei der TH Ilmenau) an das Organisationskomitee zu senden. Bitte halten Sie diesen Termin ein. Sie tragen damit bei, daß das Diskussionsmaterial (Tagungsbericht) vor Beginn der Veranstaltung allen Tagungsteilnehmern zur Verfügung steht. Das Vortragsprogramm erhalten Sie im Mai 1973.

Mit vorzüglicher Hochachtung

  
Prof. Dr.-Ing. G. Linnemann  
Nationalpreisträger

# University of the Witwatersrand, Johannesburg



Department of Chemistry including Biochemistry

Jan Smuts Avenue, Johannesburg, South Africa

Telephone 724-1311 Telegrams 'University'

10th February, 1973

Dr. D. Cvetković  
Faculty of Electrical  
Engineering  
University of Belgrade  
Belgrade  
Yugoslavia.

---

Dear Dragoš,

Many thanks for your letter of 22nd December, 1972, which I was very pleased to receive. I must apologize for not getting round to answering a lot sooner.

I should also like to thank you very much for the two papers you sent me at that time. These I found most interesting to read and very relevant to some of my own researches. If you have any similar or related papers which you have not yet sent me, I would be most grateful if you would send them over to me.

At the moment I'm not producing any papers of interest to you as a mathematician, only chemical works. But in about six month's time I hope to have a couple of papers available which might well interest you. I will of course be very happy to send these over to you.

May I ask if you have had an opportunity yet to consider further the possibilities of developing the ideas contained in my paper on tripartite graphs? I should be pleased to hear of any new developments.

In conclusion I send you my very best wishes for a happy 1973 and hope that I may hear from you again in the near future.

Yours sincerely,

A handwritten signature in cursive script, appearing to read 'Dennis', with a long horizontal stroke extending to the right.

D. H. Rouvray.

Professor

Dragoř G. Cvetkovič

Faculty of Electrical  
Engineering  
University of Belgrade

Redakce časopisů:  
**ČASOPIS PRO PĚSTOVÁNÍ  
MATEMATIKY**  
CZECHOSLOVAK  
MATHEMATICAL JOURNAL  
115 67 Praha 1, Žitná 25  
Tel. 226601 až 3

Věc

Č. j.:

V Praze dne February 26, 1973

Dear Sir:

We beg to send you enclosed the proofs of your paper "On a graph theory problem of M. Koman". You are kindly requested to correct them as soon as possible.

Sincerely yours,

ČASOPIS PRO PĚSTOVÁNÍ MATEMATIKY  
A  
CZECHOSLOVAK MATHEMATICAL JOURNAL  
REDAKCE:  
PRAHA 1, ŽITNÁ ULICE 25

6.3.1973

Ředakce časopisu  
časopis pro Peštování  
matematiky  
Czechoslovak Mathematical  
Journal  
115 67 Praha 1  
Žitna 25

Dear Sirs,

Please find enclosed herewith the corrected proofs of my  
paper as well as the manuscript.

With kind regards,

Yours sincerely

Dragoř Cvetković



22nd March 1973

Dear Dr Cvetković,

Your letter dated 26 Jan. has just reached me, the delay being caused by my temporary absence from England. I shall endeavour to send you the unpublished note you ask for when I return home in April. In that paper I obtained the following formula for the complexity (= number of spanning trees) of a graph  $\Gamma$ , which is regular of valency  $k$ :

$$\kappa(\Gamma) = \frac{1}{n} \prod (k - \lambda_r)^{m_r} = \frac{1}{n} \chi'(k).$$

( $n$  = number of vertices)

Here the eigenvalues of  $\Gamma$  are  $\lambda_r$ , with multiplicity  $m_r$ , and  $\chi$  is the characteristic polynomial. I applied this to the cubes  $Q_k$ , getting

$$\kappa(Q_k) = 2^{2^k - \frac{1}{2}(k^2 - 3k + 2)} 3^{\binom{k}{3}} 4^{\binom{k}{4}} \dots k^{\binom{k}{k}}.$$

At the moment I have just finished writing a monograph entitled Algebraic Graph Theory, which will be published next year. I have put most of what I know in that book.

I have a copy of your thesis "Graphs and their Spectra" which was kindly sent to me by Prof. H. Sachs; I found it very interesting & useful. If you have offprints of your other papers, I should be most grateful to receive these. Your recent paper in Mat. Vesnik, with I. M. Gutman, looked interesting to me.

Best wishes,

Norman Biggs

Norman Biggs

Please reply to: Dept. of Mathematics, Royal Holloway College, Egham, Surrey, England.



The University of Manitoba

Department of Mathematics and Astronomy

Winnipeg, Canada R3T 2N2

March 22, 1973

Dr. Dragoš Cvetković,  
Department of Mathematics,  
Faculty of Electrical Engineering,  
University of Beograd,  
P.O. Box 816,  
11.001 Beograd, Yugoslavia

Dear Dr. Cvetković:

Thank you for your most recent letter. I am sorry that I have not been able to reply sooner, but my plans did not become final until recently. I shall be arriving in Beograd on June 9; if all goes according to plan, my wife, my daughter (who is two years old), and I would like to leave on June 11. Could I accept your kind offer and have you book me a hotel room for the appropriate nights? We would be content with a simple room with a double bed and without a bathroom.

Enclosed is the publication list that you requested. I certainly shall look forward to our meeting since I am sure there is much we can talk about.

Thank you very much for your help.

Sincerely yours,

Michael Doob

MD:B  
Enc.

3.4.1973

Mr. Norman Biggs  
Department of Mathematics  
Royal Holloway College  
Egham, Sussex  
England

Dear Mr. Biggs,

Thank you very much for your kind letter of 22.3.1973.

Please find enclosed herewith the reprints of my papers,  
which may be of interest to you.

I believe that your monograph will be very interesting and  
I am looking forward to reading it.

Thanking you again for the interest shown in my work,

Yours sincerely

Dragoš Cvetković



6.4.1973

Mr.L.Babai  
Secretary of the Organizing  
Committee of the  
International Colloquium  
on Infinite and Finite Sets  
Bolyai Janos Matematikai Tarsulat  
1368 Budapest  
P.f. 240

Dear Sir,

I would like to take part in the work of the Colloquium which will be held from 25.6. to 1.7.1973. Please let me know the programme and the manner of work of the colloquium as well as other data (participants accommodations etc).For the time being I am not able to propose any paper of mine for the colloquium.

Thanking you in advance,

Yours sincerely

Dragoř Cvetković

10.4.1973

Dragoř Cvetković

Prof. R.C.Bose  
Colorado State University

Dear Professor Bose,

I had the opportunity of getting acquainted with you in Bressanone (Italy) last year and on that occasion I gave you a copy of my paper "Graphs and their spectra". From a short conversation with you I understood that the cubic lattice graph can be characterized only by its spectral properties. I am interested in that result and I would appreciate your information in which paper or journal that result was published. If your paper is involved, please send me a reprint of it.

By the way, I had the impression of giving you a wrong address in Italy. Please note this address:

FACULTY OF ELECTRICAL ENGINEERING, Bulevar Revolucije 73,  
11000 Beograd, Yugoslavia.

Thanking you in advance for your kindness, I am

Yours sincerely

Dragoř Cvetković

24.4.1973

Mr. Michael Doob  
The University of Manitoba  
Department of Mathematics and  
Astronomy  
Winnipeg, Canada R3T2N2

Dear Mr. Doob,

Thank you very much for your letter of 22.3.1973 and for the list of your papers, which you kindly sent to me.

I have booked a two-bed room for you in the hotel "Kasina" in Beograd (address: Terazije 25) for 9th and 10th June.

Please let me know the exact date, hour and manner of your coming in Beograd so that I could welcome you (either at the airport or the station).

My home address is: 11000 Beograd, Mašartinova 44.

With kind regards,

Yours sincerely

Dragoš Cvetković



The University of Manitoba

Department of Mathematics and Astronomy

Winnipeg, Canada R3T 2N2

April 20, 1973

Dr. Dragoš Cvetković  
Department of Mathematics  
Faculty of Electrical Engineering  
The University of Belgrade  
11.001 Beograd  
Yugoslavia

Dear Dr. Cvetkovic,

When I wrote to you last, I mentioned that I would be arriving with my wife and daughter in Belgrade on June 9. These plans remain unchanged. Since I am leaving for Europe within the week, I thought that I'd better give you an address where I can be written to on the Continent. I have received no reply from you yet, so at this time I do not know where we should go to when we arrive in Belgrade. If there are any problems, or if it is better that I make my own arrangements, I can be written to at the following address:

c/o H. Lippuner  
Hofacker 3  
8624 Grüt bei Wetzikon  
Switzerland

I thank you for any effort you have made on my behalf.

Sincerely yours,

Michael Doob

5.5.1973

Mr. Michael Doob  
c/o H.Lippuner  
Hofacker 3  
8624 Grut bei Wetzikon  
Switzerland

Dear Mr. Doob,

I apologize for a delayed reply to your earlier letter. I wrote to you in Canada, at the end of April, but probably the letter did not reach you, so that I am writing again.

I have booked a double bed room in Beograd for 9th and 10th June. The hotel address is:

HOTEL "KASINA"  
Terazijske 25  
11000 Beograd

I would like to welcome you, and that is why I am kindly asking you to let me know the exact time of your arrival, as well as the manner of your travelling ( aircraft or train).

Looking forward to our meeting,

Yours sincerely

Dragoš Cvetković

9.5.1973

Mr. L. Babai  
Secretary of the Organizing  
Committee of the International  
Colloquium on Infinite and Finite  
sets,  
Bolyai Janos Matematikai Tarsulat  
.1368 Budapest, P.F. 240

Dear Sir,

We apologize for the delayed submitting of the participation forms for the Colloquium.

We are most kindly asking you to take into consideration our Forms.

With kind regards,

Dragoš Cvetković

Slobodan Simić



EDIZIONI CREMONESE  
S.p.A. Cap. L. 150.000.000  
ROMA VIA DELLA CROCE, 77

Prof. Cvetkovic Dragos  
Lamartinova ,44  
(Jugoslavia )      1100 BEOGRAD

Roma, 17/5/1973

Monsieur,

nous avons le plaisir de vous informer que nous avons  
publié :

Cine - II Ciclo 1972 - Finite geometry structures

dont le prix est de Lit. 5,000,=

Comme vous avez droit à un exemplaire avec la remise  
du 50%, nous vous prions de vouloir bien nous envoyer le mon-  
tant de Lit. 2,500,= et nous nous empresserons de vous envoyer  
le volume .

Dan cette attente, nous vous prions d'agrées,  
Monsieur, l'expression de nos meilleurs sentiments.

EDIZIONI CREMONESE

THE UNIVERSITY OF BRITISH COLUMBIA

VANCOUVER 8, CANADA

DEPARTMENT OF COMPUTER SCIENCE

May 30, 1973

Dr. D.M. Cvetković  
Katedra za matematiku  
Elektrotehnički fakultet  
11000 Beograd, Jugoslavija

Dear Dr. Cvetković:

I would very much appreciate receiving copies of

Tables of simple eigenvalues of some graphs whose automorphism group has two orbits, Publikacije Elektrotehničkog Fakulteta (1972), 89-96

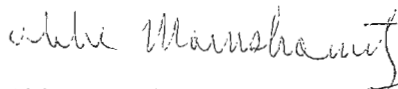
The algebraic multiplicity of the number zero in the spectrum of a bipartite graph.

Matematički Vesnik 9 (1972), 141-150

and any other related papers.

Some recent work of mine is enclosed.

Sincerely,



Abbe Mowshowitz  
Assistant Professor



Mr.

Dragos CVETKOVIC

Lamartinova 44

11000 BEOGRAD

210  
...../73

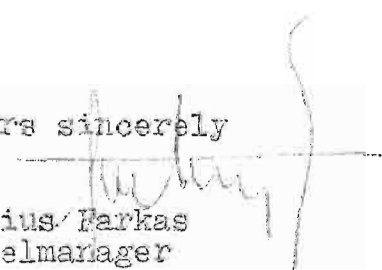
Keszthely 04.06. 1973

Dear Sir,

We confirm with thanks the receipt of your reservation, a double room with fullboard from the 25th till the 30th of June 1973.at Summerhotel Hotel.

Your room-partner will be Mr. S. SEMIC.

Yours sincerely

  
Julius Farkas  
Hotelmanager

Handwritten notes and stamps:  
Keszthely  
Hotelmanager  
Tel. 217-10067

Druže Cvetkoviću,

U okviru postdiplomskih studija na Elektronskom fakultetu u Nišu treba da pod Vašim mentorstvom obradimo oblast: Matematička logika, algebarske strukture i osnovi teorije grafova. U cilju preciznijeg definisanja materijala koji treba da obradimo molimo Vas da nam pošaljete iscrpniji program navedenih oblasti sa poglavljima i spisak odgovarajuće literature. Takodje Vas molimo da nam pošaljete program predmeta koji držite na redovnim studijama na Elektrotehničkom fakultetu u Beogradu koji obuhvata navedene oblasti.

S drugarskim pozdravom,

U Nišu, 7. 6. 73.

Marinković Slobodan,

Milenković Nebojša

PS. Molimo Vas da traženi materijal pošaljete na adresu

Milenković Nebojša  
Sindjelićev trg 14, II ul. st. 2  
18000 NIŠ

8.6.1973

*Dragoš Cvetković*

*Dr. Abbe Mowshowitz  
- Computer Science Department  
University of British Columbia  
Vancouver 9, B.C. Canada*

*Dear Dr. Mowshowitz,*

*Thank you very much for your kind letter of 30th May.*

*Please find enclosed herewith four copies of my papers.*

*My Doctorate Dissertation "Graphs and their spectra" was  
forwarded to you last year and I hope it reached you.*

*With kind regards,*

*Yours sincerely*

*DC*

*Dragoš Cvetković*

8.6.1973

*Dragoř Cvetković  
Slobodan Simić*

*Mr. L. Babai  
Secretary of the Organizing Committee  
of the International Colloquium on Infinite  
and Finite Sets,  
Bolyai Janos Matematikai Tarsulat  
1368 Budapest Pf. 240*

*Dear Sir,*

*We wish to inform you that we will arrive on 25th June in  
Keszthely, by car, at about noon.*

*With kind regards,*

*Yours sincerely*

*Dragoř Cvetković*

*Slobodan Simić*

13.6.1973

Mr. J. Sedlaček  
Matematický Ústav ČSAV  
Žitná 25  
Praha 1  
Chechoslovakia

Dear Mr. Sedlaček,

Thank you very much for your book "Einführung in die Graphentheorie" which you sent to me earlier.

I am enclosing herewith my book entitled "Teorija grafova i njene primene",

Yours sincerely

Dragoš Cvetković

13.6.1973

Dragoř Cvetković

Mrs. Renu Laskar  
Clemson University  
Clemson, South Carolina 29631  
*Department of Mathematics*

Madam,

I am very interested in new results regarding the spectral characterizations of the cubic lattice graph. I would appreciate receiving your new results on this topic, as well as the information about the papers covering that field, written by some other authors.

Thanking you in advance,

Yours sincerely

Dragoř Cvetković

19.6.1973

EDIZIONI CREMONESE  
S.p.A.  
00187 Roma  
Via Della Croce  
.

Dear Sirs,

I wish to inform you that I have paid in the sum of Lit. 2.500  
(a copy of which is enclosed herewith) for the book:

CIME -II CICLO 1972 \_ Finite geometry structures.

With kind regards

Dragoš Cvetković

ČESKOSLOVENSKÁ AKADEMIE VĚD  
**MATEMATICKÝ ÚSTAV**  
PRAHA 1, ŽITNÁ ULICE 25

V Praze dne 29.6.1973

Vážený pan  
Dr. Dragoš Cvetkovič  
Departement Mathématique  
Faculté d'Électrotechnique Université  
Bulevar Revolucije, 73  
Poštanski fah 816  
Belgrade

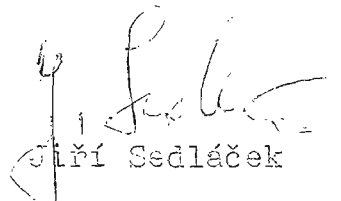
Naše značka:

Věc:

Vážený pane kolego,

děkuji Vám i Dr. M. Wilićovi za Vaši knížku "Teorija grafova i njene primene", kterou jsem dostal v minulých dnech.

Se srdečným pozdravem

  
Jiří Sedláček



Dragoř Cvetković

27.7.1973

Mr. A.J. Schwenk  
• Dept. of Mathematics  
Univ. of Michigan  
Ann Arbor Michigan, 48104 USA

Dear Sir,

From Mr. D. Singmaster, whom I met at the end of June at a colloquium on infinite and finite sets in Hungary, I learned that you had elaborated in your Dissertation some graph spectra. I would appreciate receiving your results on graph spectra.

Thanking you in advance,

Yours sincerely

Dragoř Cvetković

Dragoš Cvetković

27.7.1973

Mr. A. J. Hoffman  
Thomas J. Watson Research Center  
P.O. 30218  
Yorktown Heights  
New York 10598

Dear Professor Hoffman,

Please find enclosed herewith a copy of my paper "Chromatic number and the spectrum of a graph", which I mentioned earlier in my letter.

Yours sincerely

Dragoš Cvetković

27.7.1973

Mr. P. Weyman  
Technische Hochschule  
Sektion MAROK  
Am Ehrenberg, Block G  
DDR 63, Ilmenau

Dear Mr. Weyman

As agreed I am sending to you the copies of the papers by A.K. Kelmans, apologizing at the same time for not doing it earlier. I am most kindly asking you to send me an example of a divisor for an undirected graph which was not induced by automorphism group of the graph.

Wishing you a lot of success in your work on Dissertations, I am sending to your wife and you my regards,

Yours sincerely

Dragoš Cvetković

27.7.1973

Mr. W. Dörfler,  
3. Inst. f. Math.,  
Technische Hochschule  
Karlsplatz 13  
A-1040 WIEN

Dear Mr. Dörfler,

As agreed, I am sending to you my paper "Über die Zerlegung eines Graphen in ein Produkt von Graphen". I would appreciate your remarks and comments on the paper. If possible I would like to get the reprints of your papers on the graph products.

Yours sincerely

Dragoš Cvetković

Dragoš Cvetković

27.7.1973

Mr. Michael Doob  
The University of Manitoba  
Department of Mathematics  
and Astronomy  
Winnipeg, Canada, R 32 T 2N2

Dear Mr. Doob,

I am happy for the opportunity I had to get acquainted with you and your family. I only regret the shortness of our meeting. Later I saw that I have lost the opportunity to discuss with you about so many things.

Thank you for the card you so kindly sent from Athenes. We are glad to hear that you had a pleasant time.

I am enclosing herewith the reprint of the paper, the manuscript of which you saw, and which in the meantime is out of print.

Soon I shall write you more in detail regarding the writing of the book "Graphs and their spectra".

To Mrs. Doob and your daughter and yourself I am sending my sincere regards,

Yours faithfully

Dragoš Cvetković

Beograd 10.8.1973.

Dear Professor Riquet,

In this letter I am sending ~~to~~ you my paper "Tables of simple eigenvalues...".

Dr Petersdorf does not live in Belgrade but in German Democratic Republic. I don't know his address. But, in order to get his papers, you can write to Prof. H. Sachs, whose address reads:

Technische Hochschule Ilmenau  
Sektion MARÖK  
Am Ehrenberg, Block G  
DDR 63 Ilmenau

Yours sincerely,  
/

CLEMSON UNIVERSITY  
CLEMSON, SOUTH CAROLINA 29631

DEPARTMENT OF MATHEMATICAL SCIENCES

TELEPHONE 803/656-3434

August 16, 1973

Dr. Dragos Cvetkovic  
Department of Mathematics  
Faculty of Engineering  
University of Beograd  
P. O. Box 816  
11001 Beograd, Yugoslavia

Dear Dr. Cvetkovic:

Thank you very much for your note. I am sorry for the delay in answering your query. So far as I know the enclosed paper gives the spectral characterizations of the cubic lattice graph -- of course, the paper assumes one more condition. I don't know whether anybody else has improved the result or considered the exceptional cases.

I would be very much interested to get reprints or preprints of your work.

Thanking you,

Yours sincerely,



Renu Laskar  
Associate Professor

RL/cmh

III. INSTITUT FÜR MATHEMATIK  
TECHNISCHE HOCHSCHULE WIEN  
A-1040 WIEN, KARLSPLATZ 13, TEL. 65 76 41  
VORSTAND: o. PROF. DR. RUDOLF INZINGER

WIEN, am 11. 10. 67

Mr. Dragoš Cvjetković  
Department of Mathematics  
Faculty of Electrical Engineering  
University of Belgrade  
P.O. Box 616  
11.001 Belgrade

Dear Mr. Cvjetković

Thank you very much for sending me a copy of your paper "Über die Zerlegung eines Graphen in ein Produkt von Graphen" which I have read with great interest. There is one trivial thing one could mention in Satz 4, namely, that under the conditions of the theorem the graph  $G$  is of the form  $G = K_2 \times H$  where  $H$  is a prime graph. As a general remark I have the feeling that it will be difficult to give a complete characterization of the prime graphs and that one should rather try to study the composite ones. That seems to be because there are "much more" prime graphs than composite ones and because the latter ones have more structure. But nevertheless I don't have a characterization of composite graphs.

I enclose reprints of my papers on graph products.

Yours sincerely

  
W. Dörfner



31.8.1973

Mrs. Renu Laskar  
Associate Professor  
Clemson University  
Clemson, South Carolina 29631

Madam,

Thank you very much for your letter of 16th August.  
I am enclosing herewith the reprint of my paper entitled  
"New Characterizations of the Cubic Lattice Graph".

Yours sincerely

Dragoš Cvetković



THE UNIVERSITY OF MANITOBA

September 9

DEPARTMENT OF MATHEMATICS AND ASTRONOMY

WINNIPEG, CANADA

Dear Dr and Mrs. Cvetković,

I presume that your last letter was sent after I sent the manuscript to you, and that you have now received it. If the manuscript has not yet arrived, please let me know at once and I shall send you another copy. I sent it to your university.

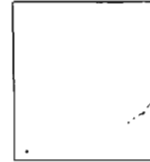
Avec cette lettre sont deux photos que j'ai prises à Kalamegdon Parc. Ma mère et moi, nous n'avons pas oublié des plaisirs de notre connaissance à Beograd.

Incidentally, after three months Hoffman and Seibel have now completed the Table of Contents of their book.

Sincerely  
Michael

POST CARD

THE ADDRESS TO BE WRITTEN ON THIS SIDE



write a final draft and send you both a copy.

With many thanks,

Yours sincerely,

Robin J. Wilson

Dear Dr. Gutzmer

because the last ~~part~~ ~~of~~ ~~my~~ ~~and~~,  
kinda. It is the same result, with.  
I am

UNIVERSITY OF OXFORD

Mathematical Institute, 24-29 St Giles, Oxford, OX1 3LB

Telephone Oxford (0865) 54295

21 Sept. '73.

Dear Dr. Gutzmer,

~~My~~  
I have rewritten my eigenvalue article for a chapter of a book I am writing. If you can spare the time, could you possibly comment (in the next six weeks) on the style and content of it - for example, is it readable and are any major results left out? Also if Prof Cuthovic has any comments, & even if they are minor ones, I should like to know. After I have received the comments from you and other people, I shall



THE UNIVERSITY OF MANITOBA

DEPARTMENT OF MATHEMATICS AND ASTRONOMY

WINNIPEG, CANADA

September 24, 1973.

Dr. Dragoš Cvetković,  
Department of Mathematics,  
Faculty of Electrical Engineering,  
University of Beograd,  
P.O. Box 816,  
11,001 Beograd,  
Yugoslavia.

Dear Dr. Cvetković;

Thank you for your recent letter. It reminded me of the question you asked me when I was visiting you, namely, can the least eigenvalue of  $K_{n_1, \dots, n_k}$  be expressed as a function of  $n$  and  $k$ . I can give you a reasonable conjecture now. If  $n \geq 3k - 4$ , then the minimum is attained when  $n_1 = \left\lfloor \frac{n-k+1}{2} \right\rfloor + 1$ ,  $n_2 = \left\lfloor \frac{n-k}{2} \right\rfloor + 1$ , and  $n_3 = n_4 = \dots = n_k = 1$ . If  $n \leq 3k - 4$  then the minimum is attained when  $n_1 = n - k + 1$  and  $n_2 = \dots = n_k = 1$ . The line of reasoning is as follows: assume  $n_1 \geq n_2 \geq n_3 \geq \dots \geq n_k$ . If  $n_3 > 1$ , the graph with  $\bar{n}_1 = n_1 + 1$ ,  $\bar{n}_3 = n_3 - 1$ , and  $\bar{n}_k = n_k$  for all other  $k$  has a smaller least eigenvalue. Hence  $n_3 = n_4 = \dots = n_k = 1$  in the graph that attains the minimum. Now looking at all graphs with  $n_1 = n + k - 2 + r$ ,  $n_2 = r$ ,  $n_3 = \dots = n_k = 1$  the least eigenvalue is a monotonic function of  $r$ . It is increasing if  $n < 3k - 4$ , decreasing if  $n > 3k - 4$  and constant if  $n = 3k - 4$ . It is now clear why the case  $k = 4$  looked so strange in the table of Mr. Simić. It is the only value that had a perceivable difference.

I also regret the shortness of my visit with you. I am enclosing an article from our local newspaper that might be of interest to you - a Canadian's view of life in Yugoslavia.

Ma marie et moi, nous vous envoyons les meilleurs felicitations. Nous avons les memoires tres bien du temps nous avons passé avec vous en Yugoslavie, meme Lisa, qui, de temps en temps, a remarque vers "le garçon avec les ballons".

Sincerely,

Michael

Michael Doob.

MD/M

Enc. 1.

P.S. As a word of clarification, I have proved that the graph with  $\bar{n}_1 = n_1 + 1$  and  $\bar{n}_3 = n_3 - 1$  indeed has a smaller eigenvalue only for  $k=3$  and some other special cases. The other statements have been proven. Sometimes it is a little better to let  $n_2 = \bar{n}_2 + 1$  depending on the relative sizes of  $n$  and  $k$ .

Also, Rena Lasker tells me she knows of no existing proof of the characterization of the cubic lattice graph using only the spectrum.

5.11.1973

Mr. Robin J. Wilson  
University of Oxford  
Mathematical Institute  
24-29 St. Giles  
Oxford, OXI 2LB

Dear Mr. Wilson,

Mr. Gutman has shown to me your letter as well as the manuscript of the Chapter of your book regarding graph spectra. I deem that it is very nice expository text on this topic, and I do not have any remarks.

I would like to know when the book will be published, under which title and who is the publisher.

I take this opportunity to send you two of my papers relevant to graph spectra.

With kind regards,

Yours sincerely

Dragoš Cvetković

8.11.1973

Mr. J. Williamson  
Math. Department  
Western Michigan University  
Kalamazoo MI 49001 USA

Dear Sir,

I am most kindly asking you to inform me on the details of  
subscribing to GRAPH THEORY NEWSLETTER. Are the back numbers  
available?

Looking forward to your news,

Yours sincerely

Dragoš Cvetković



8.11.1973

ACTA MATHEMATICA  
BUDAPEST 502  
Postfach 24  
Hongry

Dear Sirs,

In February 1971 I sent you a paper of mine intended to be published in your journal. The paper is entitled:

INEQUALITIES OBTAINED ON THE BASIS OF  
THE SPECTRUM OF THE GRAPH

Up to now I did not get any information regarding the paper. Is it accepted for publication or not.

I would appreciate your reply on the above.

Yours sincerely

Dragoš Cvetković

November 16, 1973

I N V O I C E

To: *Drago's Cvetković*  
*Dept. of Mathematics*  
*Faculty of Electrical Engineering*  
*Un. of Belgrade*  
*P.O. Box 216*  
*11.001 Belgrade YUGOSLAVIA*

PLEASE REMIT \$ 3.00 (U.S. funds) payable to  
the order of the Department of Mathematics, Western  
Michigan University, for a subscription to the

GRAPH THEORY NEWSLETTER

Volume 1, September 1971 to July 1972.

Thanking you.

Sincerely,

*Linda Lesniak*

Linda Lesniak  
Editor

November 16, 1973

Dear Mr. Cvetković,

I am enclosing an invoice for each of  
volumes 1, 2, and 3 of the Graph Theory  
Newsletter. Volume 3 is the current  
volume and volumes 1 and 2 are available  
upon payment of \$2.00 for each

Sincerely,  
Ginda Jesniak  
Editor

19.11.1973

Prof. Dr. Horst Sachs  
Technische Hochschule Ilmenau  
Section MAROK  
DDR 63 Ilmenau  
Am Ehrenberg, Block 6

Dear Professor Sachs,

I apologize for my delayed writing to you, due to a lot of work, at the Faculty and to my business at home.

Thank you for the dinner, excursion and all other aspects of your kindness extended to me.

I am enclosing herewith the text of the problem which I posed at the colloquium.

Soon I shall send you a part of the manuscript of our book which is relevant to the applications in chemistry.

I proposed to the Organizing Committee of the Balkanic Congress to invite you. Please let me know whether the invitation reached you.

My wife is very thankful to you and your wife for the present.

Please convey my regards to Mrs. Sachs.

Yours sincerely

Dragoš Cvetković

19.11.1973

Mr. Runge  
Technische Hochschule, Ilmenau  
Section MAROK  
DDR 63, Ilmenau  
Am Ehrenberg, Block G

Dear Mr. Runge,

I apologize for my delayed writing to you, due to a lot of work, at the Faculty as well at home.

Thank you for the help which you extended to me during my stay in Ilmenau.

The proof of the theorem of Bruck and Ryser, i.e. of the theorem of Bruck, Ryser and Chowla is to be found in the book MARSHALL HALL Combinatorial theory. The books may be found, probably with Prof. Sacks, and there is an Russian translation of the book.

A.J. Hoffman in his paper entitled Eigenvalues and Partitionings of the Edges of a Graph has used Courant-Weyl inequalities, known in matrix theory, for obtaining the inequality for some characteristics of a graph. (Linear Algebra and its applications 5, 137-146, (1972)).

With kind regards,

Yours sincerely

Dragoš Cvetković

Dragi kolega,

Vraćam vam pozajmljenu knjigu u , čini mi se , obećanom roku .  
Bila mi je od velike koristi , te sam na kraju napravila jednu  
kompletnu kseroks kopiju.

U međuvremenu sam sa asistentom napravila program za trasiranje  
planarnog grafa na FORTRAN IV. Program je još u fazi testiranja .  
Tražila sam ovde reference koje su se odnosile na isti tip algoritma ,  
ali zasada nisam ništa našla. Izvršiću narudžbu preko naše biblioteke  
pa će valjda nešto stići. Prikazi u ruskom referativnom žurnalu su  
isuviše kratki da bi mogla da zaključim da li je moj algoritam potpuno novi.

Čini mi se da sam našla način za trasiranje grafa i na površine višeg  
roda , ali nisam još sasvim sigurna. Kada budem imala sredjenije misli  
javiću vam se ili ću doputovati u Beograd.

Mnogo vam se zahvaljujem na pomoći ukazanoj prilikom moje posete i  
pozajmljenoj knjizi.

Pismo sam napisala na mašini da vas ne bih mučila sa mojim apsolut-  
no nečitljivim rukopisom.

*Branka Klučič*

PRIRODOSLOVNO MATEMATIČKI FAKULTET  
SVEUČILIŠTE U ZAGREBU  
D e k a n a t

Broj: 05 - 4328/2 - 1973.  
Zagreb, 4.prosinca 1973.

O G L A S

Prédmet: Ivan Gutman, obrana  
doktorke disertacije

Na temelju zaključka Vijeća nastavnika, donesenog na sjednici od 22.studenog 1973. određuje se u sporazumu s Ivanom Gutman, asistentom Instituta "Ruđer Bošković", dan obrane doktorske disertacije

četvrtak 20.prosinca 1973. u 13 sati  
-----

u predavaonici III krila Instituta "R.Bošković", Bijenička 54.

Komisiju za obranu sačinjavaju:

1. Dr ~~Mirko~~ Mirnik, red.prof.Prir.mat.fakulteta
2. Dr Dragoš Cvetković, doc.Elektro-teh.fak.Beograd
3. Dr Nenad Trinajstić, v.n.sur.Instituta "R.Bošković"
4. Dr Zvonimir Maksić, v.n.sur.Instituta "R.Bošković"  
Zamjenik dr Tomislav Cvitaš, v.asistent Inst."R.B."

Disertacija nosi naslov:

"Istraživanja topoloških svojstava konjugiranih ugljikovodika".

O tom obavijest:

1. Članovima komisije
2. Kandidatu
3. Na oglasne ploče

D E K A N

Prof.dr Milan Meštrov, v.r.

PRIPROBNO ODRŽANO NAJEDINIČKI PANDIČE  
SVEUČILIŠTE U ZAGREBU  
D e k a n a t

Broj: 05 - 4328/2 - 1973.  
Zagreb, 22. listopada 1973.

1. Dr Mirko Mimik, red.prof. Zagreb
  2. Prof.dr Dragoš Cvetković, Elektrotehnički fak.  
Sveučilište u Beogradu,pošt.p.816
  3. Dr Nenad Trinajstić, v.nauč.sur.Instituta "R.B."
  4. Dr Zvonimir Maksić, nauč.sur.Instituta "R.B."
- Z a g r e b

Vijeće nastavnika ovog fakulteta izabralo Vas je na sjednici od 18. listopada 1973. u komisiju za ocjenu i obranu doktorske disertacije Ivana Gutmana iz Zagreba.

Disertacije nosi naslov:

"Istraživanja topoloških svojstava konjugiranih ugljikovodika".

Molimo da, najkasnije u roku od tri mjeseca, dostavite Vijeću izvještaj i ocjenu disertacije.

Prilog: disertacija

D e k a n  
*M. Meštrović*  
Prof.dr Milan Meštrović



13.12.1973

AMERICAN MATHEMATICAL SOCIETY  
P.O.Box 6248  
Providence R.I. 02940  
USA

Dear Sirs,

Thank you very much for your kind invitation to join the American Mathematical Society.

As the membership-fees I enclose herewith the order form for reviewers.

Yours respectfully

Dragoš Cvetković

# »RUDER BOŠKOVIĆ« INSTITUTE

41001 Zagreb, Croatia, Yugoslavia

POB 1016  
PHONE: (041) 424-355  
TELEX: 21-383

Zagreb, 3.1.1974.

Dragi Dragoš.

Prvog radnog dana nove godine želim Ti svu najbolju i mnogo novih radnih uspjeha.

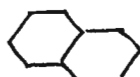
Zadnjeg dana decembra poslali smo Ti rad "Graph Theory... IX", koji je istog dana poslan u "Theoretica Chimica Acta". Živković je odbio da bude autor pošto smatra da nije doprineo radu.

Danas Ti šaljem rukopis jednog rada koji je nastao u Samoboru tokom novogodišnjih praznika, i to prilikom određivanja

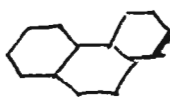
$\lim_{i \rightarrow \infty} \frac{N_i}{\sqrt{|\det A_i|}}$  u seriji



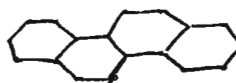
$G_1$



$G_2$



$G_3$



$G_4$

...

$A_i$  je matrica susjedstva a  $N_i$  broj čvorova grafa  $G_i$ .

Molio bih da ga, kada Ti to slobodno vreme dozvoli, pročitaš i eventualno komentiraš. Kako sam očigledno bio inspirisan Tvojom idejom o preslikavanju neke funkcije s prstena na prsten, slobodan sam predložiti da budeš koautor. Molio bih Te da odgovoriš u vezi toga.

Rukopis ću dati na jezičku korekciju. U koliko rad ne bi pretrpio bitnijih izmena, rado bih ga poslao u "Croatia Chemical Acta", a ako bi nam ambicijom porasla u "Journal of Chemical Physics".

Šalj<sup>e</sup>m Ti r<sup>e</sup>f<sup>e</sup>r<sup>e</sup>nc<sup>e</sup> koj<sup>e</sup> si tražio izuz<sup>e</sup>v rada Bochvara  
i Stank<sup>e</sup>vicha, koji još nisam usp<sup>e</sup>o pronaći. Postupak oko isplat<sup>e</sup>  
honorara, dn<sup>e</sup>vnica i putnih troškova za Tvoj n<sup>e</sup>давni boravak u  
Zagr<sup>e</sup>bu j<sup>e</sup> u toku.

Primi sr<sup>e</sup>dačn<sup>e</sup> pozdrav<sup>e</sup>

*Jovan*

»RUĐER BOŠKOVIĆ« INSTITUTE

41001 Zagreb, Croatia, Yugoslavia

POB 1016  
PHONE: (041) 424-355  
TELEX: 21-383

Zagreb, 16.1.1974.

Dragi Dragoš.

Šaljem Ti i poslednju referencu koju si tražio. Bilo je potrebno da se toliko čeka jer su odgovarajući separati bili kod Graovca.

Inače, u vezi rada kojeg sam Ti poslao početkom godine, moram javiti da se dogodilo ono čega sam se pomalo i plašio. Naime, rad Gordona i Devisona u J.Chem.Phys. u znatnoj se meri "podudara" sa ovim radom. U Samoboru mi nije bilo na raspolaganju taj rad, te sam "podudarnost" otkrio tek u Zagrebu (onog istog dana kada sam Ti rad i poslao).

Imajući to na umu biće potrebno što-šta izmeniti, ako uopšte budemo zaključili da su takvi rezultati za objavljivanje. Očekujem Tvoje komentare.

Srdačni pozdravi

*Jvan*

Dragoř Cvetković

22.1.1974

Prof. Dr. rer.nat.habil.Horst Sachs  
Technische Hochschule Ilmenau  
DDR 63 Ilmenau  
Am Ehrenberg,Block G

Dear Professor Sachs,

As a sign of thankfulness for your kind assistance in my elaboration of doctorate thesis and your hospitality which you extended to me in GDR and having in view our cooperation lasting already several years, I take the liberty to invite you and your wife to be my guests in Yugoslavia, for three weeks at the end of June and beginning of July. It would be an occasion to attend the Balkan Mathematical Congress and to meet Yugoslav mathematicians. The Mathematical Institute in Belgrade is interested that you deliver a few lectures on graph theory. A part of your stay in Yugoslavia would be for resting.

Yours sincerely

Dragoř Cvetković

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Zagreb, 23.1.1974.

Dragi Dragoš.

Primio sam Tvoje pismo od 21.1. i odmah Ti odgovaram jer je dosta toga "sazrelo".

I Ja bih Te i dalje molio da budeš koautor na radu "Kekulé Structures and Topology II". Bez obzira što sam tehnički dio računanja napravio ja, ideja o preslikavanju (nečega) iz prstena u prsten, koja me je svakako vodila, potiče od Tebe. Kao što vidim, i Ti se baviš sličnim problemima, pa bi to bio razlog više za zajednički rad.

Kao što sam već javio, pišući rad u Samoboru ponovo sam otkrio neke odavno objavljene rezultate Gordona i Devisona, a o "preklapanju" sam saznao tek dolaskom u Zagreb, kada sam mogao da prostudiram njihov rad. Osnovne "sličnosti" su: 1. Njihov rezultat također važi za sve cata-kondenzirane sisteme (i benzenoidne i nebenzenoidne). Pored toga njihov algoritam je daleko jednostavniji. 2. Oni na tačno isti način eliminiraju z-grane u nebi-kromatskim grafovima.

Sada sam rad malo preradio. Glavne izmene su:

u uvod je ušla rečenica: Although in the paper of Gordon and Davison there is an elegant and complete enumeration technique for this latter molecules, we think that the formalism developed here might be of interest also.

u uvod je ušla i rečenica: An additional interesting fact is that a problem completely analogous to the enumeration of Kekulé structures, called "the dimer problem" appears in the statistical mechanics of liquid and solid state.

Dodao sam i reference: Fowler, Rushbrooke, Trans. Faraday Soc. 33 (1937) 1272; Kasteleyn, Physica 27 (1961) 1209; Temperly, Fisher, Phil. Mag. 6 (1961) 1061.

Zbog svega toga mislim da bi ovo moglo ići u "Croatia Chimica Acta", pa neka recenzenti odluče da li je za objavljivanje. Ja ću započeti tehnički dio oko pripremanja rukopisa za slanje u časopis, a Tebe bih molio da se još jednom izjasniš o mojoj molbi.

Zagreb, 28.1.1974.

Dragi Dragoš.

Znam da Te "bombardujem" pismima, ali rezultati koje sam Ti javio u prošlom pismu su sada, uglavnom, dokazani. Vrlo me zanima Tvoje mišljenje, naročito da li je to za Teoriju grafova trivijalno ili ne.

Ponovio bih, sada nešto preciznije formulirane, rezultate do kojih sam došao.

Neka je zadan graf  $G = G_N$  sa  $N$  čvorova. Čvorovi neka su, na neki način, označeni sa  $q_1, q_2, \dots, q_N$ .

Izbacivanje iz grafa  $G$  čvora  $q$  i svih njemu susjednih grana označićemo sa  $G-q$ . Tako neka bude:

$$G_{N-1} = G_N - q_N$$

$$G_{N-2} = G_{N-1} - q_{N-1}$$

.....

$$G_1 = G_2 - q_2 = \text{čvor } q_1$$

$$G_0 = G_1 - q_1 = \text{nula graf, bez čvorova}$$

Jasno je da  $G_j$  sadrži  $j$  čvorova. Niz grafova  $(G_N, G_{N-1}, \dots, G_2, G_1, G_0)$  zvaćemo "razlaganje grafa  $G$ " i označiti sa  $\mathcal{R}$

$$(G_N, G_{N-1}, \dots, G_2, G_1, G_0) = \mathcal{R} = \mathcal{R}(G) \quad (1)$$

Determinanta matrice susedstva grafa  $G_j$  označena je sa  $D_j$ . Po definiciji je  $D_0=1$ . Uređenu  $(N+1)$ -torku brojeva  $(D_N, D_{N-1}, \dots, D_0)$  označićemo sa  $[\mathcal{R}]$ . Broj promena znaka elemenata niza  $[\mathcal{R}]$  označićemo sa  $pz[\mathcal{R}]$ .

#### Lema 1

Za sve  $\mathcal{R}$  je

$$D_N = D_{N-1} = \dots = D_{N-N_0+1} = 0 \quad (2)$$

Neka je  $A(G_j)$  matrica susedstva grafa  $G_j$  i  $D_j = \det A(G_j)$ .  
 Pri tome je  $D_1=0$  i  $D_0=1$ .

Tvrđnja 1

Ako  $G$  ima  $N_0$  nula u spektru, mora biti

$D_N = D_{N-1} = \dots = D_{N-N_0+1} = 0$  za sve  $\mathcal{R}(G)$ , a mogu se naći takvi  $\mathcal{R}(G)$  da je  $D_{N-N_0} \neq 0$ .

Tvrđnja 2

Mogu se naći takvi  $\mathcal{R}(G)$  da je broj promena znaka u nizu  $D_N, D_{N-1}, \dots, D_1, D_0$  jednak broju  $N_-$ .

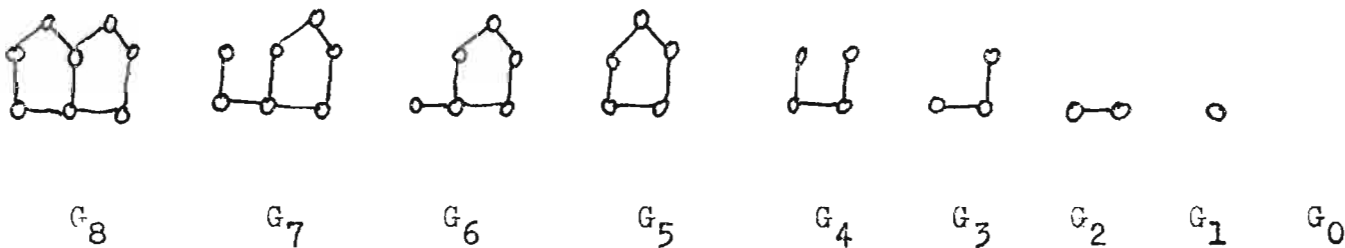
Neka se  $G_j$  dobiva iz  $G_{j+1}$  pazeći da po mogućnosti bude  $D_j \neq 0$ . (Za ovo je potrebna intuicija i to je slaba tačka celog postupka.) Tako dobivene  $\mathcal{R}$ -ove nazivaću korektnim.

Tvrđnja 3

Za sve korektne  $\mathcal{R}$ -ove važe Tvrđnje 1 i 2.

Ja nemam dokaz za ovo, ali se do sada sve provere slažu. Mislim da nije potrebno da se posebno ističe da je to elegantan i vrlo jednostavan način za računanje  $N_0$  i signature grafa ( $N_+ - N_-$ ).

Primer:



$D_8$	$D_7$	$D_6$	$D_5$	$D_4$	$D_3$	$D_2$	$D_1$	$D_0$
0	-2	-1	+2	+1	0	-1	0	+1

Sledi  $N_0 = 1$  (iz tvrđnje 1) i  $N_- = 3$  (iz tvrđnje 2 i 3)  $\Rightarrow N_+ - N_- = 1$ .

Da li su ove tvrđnje istinite? Da li ovakav postupak može biti koristan? Da li je ovaj rezultat poznat u teoriji grafova? Bio bih vrlo zahvalan ako bi prosudio ove rezultate.

U očekivanju odgovora,

srdačni pozdravi

*Ivan*



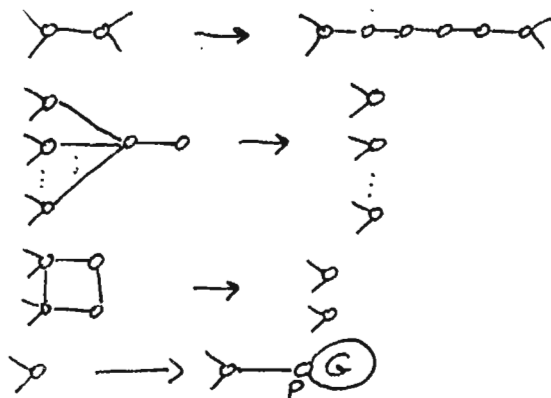
p.s.

1.  $D_j$  se naravno računaju iz Sachsove formule.
2. „Veliki“ rad o nalamama u spektru je u pripremanju.  
Prva gruba verzija je napisana i trenutno je kod Živkovića na čitanju.

II U slučaju ako bi se mogli iskoristiti radovi o dime-  
 rima, prirodno bi bilo ~~px~~ planirati i III dio ove serije. Ja sam  
 se u međuvremenu i sâm počeo baviti tim problemom. (Graovac, koji  
 se u USA bavio kristalnim rešetkama, je čak obećao da će održati  
 kolokvij o Isingovom problemu.) Pregledao sam sva tri gore nave-  
 dena rada a čitam i članak Montrolla. Zasad se ne mogu hvaliti  
 da sam puno toga razumeo, ali račun s pfafianom je za mene vrlo  
 primamljiv.

U pismu pomínješ mogućnost da je "transfer matrix" metoda  
 identična sa  $O^+ - O^-$  tehnikom. Ako je to tačno, bilo bi to svakako  
 neočekivano, jer se  $O^+$  i  $O^-$  matrice mogu primeniti samo na jednu  
 klasu grafova koje sigurno nisu od interesa za problem dimera.  
 Molio bih Te, zato, da pošalješ reference ili, eventualno, kopije  
 članka o "transfer matrix" metodi.

III Uspeo sam dokazati ~~u~~ da se signatura grafa održava za  
 transformacije



gde je  $N_0(G) = 0$  i  $N_0(G-p) = 1$ , dok su se kod "pete" transforma-  
 cije



pojavile teškoće. Da li je to od interesa za Tebe ?

IV Na kraju bih Te želeo obavestiti odnosno zamoliti za  
 mišljenje o jednom rezultatu koji me sada jako oduševljava, a ko-  
 ji, ako je tačan, ima prvorazredni značaj za hemiju.

Neka je  $G = G_N$  neki graf. Označimo sa  $\mathcal{R}(G) = \{G_N, G_{N-1}, G_{N-2}, \dots, G_2, G_1, G_0\}$  niz ~~grafova~~ grafova takvih da se  $G_j$  dobiva  
 iz  $G_{j+1}$  odbacivanjem jednog (proizvoljnog) čvora. Očigledno  $G_j$  ima  
 $j$  čvorova. Pri tome je  $G_1$  čvor bez grana a  $G_0$  nula graf.

Neka graf  $G$  ima  $N_+$ ,  $N_0$  i  $N_-$  pozitivnih, nula i negativnih  
 elemenata u spektru ( $N_+ + N_0 + N_- = N$ ).

Lema 2

Postoji  $\mathbb{R}$  za koji je

$$D_{N-N_0} \neq 0 \tag{3}$$

Teorem 1

Ako  $\mathbb{R}$  zadovoljava (3) i (4):

$$(D_{j-1})^2 + (D_j)^2 \neq 0 \quad j=1,2,\dots,N \tag{4}$$

onda je

$$N_- = \text{pz } [\mathbb{R}] \tag{5}$$

Posledica

Za sve  $\mathbb{R}$  je

$$N_- \geq \text{pz } [\mathbb{R}] \tag{6}$$

Posledica jedn. (6) je da je za  $\mathbb{R}$  iz (1):

$$N_-(G) \geq N_-(G_j) \quad j=1,2,\dots,N \tag{7}$$

Specijalno:

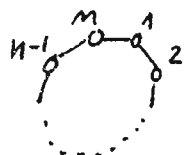
1. Graf koji sadrži makar jednu granu ima  $N_- \geq 1$ .
2. Graf koji sadrži makar jedan trougao ima  $N_- \geq 2$ .
3. Graf koji sadrži kao podgraf kompletan graf sa  $n$  čvorova ima  $N_- \geq n-1$ .

(Ovo sadrži 1. i 2. kao specijalne slučajeve !)

4. Ako je najmanja kontura sadržana u grafu duljine  $n$ , onda:

$$N_- \geq n/2 \quad \text{za parno } n, \text{ i } N_- \geq (n+1)/2 \quad \text{za neparno } n,$$

izuzev (i to su jedini izuzeci) ako je graf oblika:



o o o ... o

$$n \equiv 0 \pmod{4}; \text{ tada je } N_- = (n-2)/2$$

$$n \equiv 1 \pmod{4}; \text{ tada je } N_- = (n-1)/2$$

Bez dokaza je za sada

Teorem 2

Postoji  $\mathbb{R}$  koji zadovoljava zahteve iz Teorema 1.

*Pozdrav  
Joan*



108 BERLIN, JOHANNES-DIECKMANN STRASSE 10  
Postfach 1216

Herrn

Dr. D. Cvetković

11 000 B e o g r a d

Lamartinova 44

Jugoslawien

Ihr Zeichen

Ihre Nachricht vom

Unser Zeichen/Hausruf

Tag

At/Bj

31.1.74

Betreff

Graphs and their spectra

Sehr geehrter Herr Dr. Cvetković !


Wir freuen uns, Ihnen mitteilen zu können, daß der Verlag Academic Press nach wie vor sehr großes Interesse an Ihrem gemeinsam mit Herrn Professor Sachs geplanten oben genannten Publikationsvorhaben bekundet, aber auch den Wunsch geäußert hat, weiteres Material - wie Probekapitel - zu erhalten. Obwohl uns Herr Prof. Sachs bereits zur Herbstmesse 1973 entsprechende Unterlagen zugesagt hatte, haben wir bis heute nichts erhalten und nun erneut um die Übersendung von Manuskriptteilen gebeten. Den Verlagsvertrag werden wir ausfertigen, sobald uns die ersten Kapitel vorliegen. Da das Werk im Jahre 1976 erscheinen soll, benötigen wir das satzfertige Manuskript komplett bis spätestens Mitte des Jahres. Wir möchten daher den 30.6.74 als Termin für die Übergabe des Manuskripts an den Verlag in den Vertrag aufnehmen und hoffen, daß uns Herr Prof. Sachs diesen Termin bestätigt. Wir nehmen an, daß Sie sich anlässlich Ihres Aufenthaltes in Ilmenau bereits über die Aufteilung des Honorars geeinigt haben, und haben daher Herrn Prof. Sachs gebeten, uns eine Entscheidung darüber mitzuteilen.


Wir wären Ihnen jedoch sehr dankbar, wenn Sie uns mitteilen würden, ob das gesamte Honorar transferiert werden soll oder ob Sie einen gewissen Betrag zum Verbrauch in der DDR - etwa während eines Aufenthaltes beziehungsweise zum Ankauf von Büchern - zurückzustellen wünschen.

Wir sehen Ihrer Rückäußerung gern entgegen und verbleiben

mit vorzüglicher Hochachtung  
und freundlichen Grüßen

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BN 90130937

Handwritten initials or stamp in the top right corner.

Herrn  
Dr. D. Ovetković

11 010 Beograd  
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15/Bj  
14.1.73

Graphs and their spectra

Sehr geehrter Herr Dr. Ovetković !

Wir freuen uns, Ihnen mitteilen zu können, daß der Verlag Academic Press nach wie vor großes Interesse an Ihrem gemeinsam mit Herrn Professor Sachs geplanten oben genannten Publikationsvorhaben bezeugt, aber auch den Wunsch geäußert hat, weiteres Material - die Probekapitel - zu erhalten. Obwohl uns Herr Prof. Sachs bereits zur Herbstmesse 1972 entsprechende Unterlagen zu esart hatte, konnten wir bis heute nichts erhalten und nun erst ist um die Überlieferung von dem Material zu werden. Den Verlagsvortrag vom 12. 12. 1972 betreffend, sobald das die ersten Kapitel vorliegen. Das Werk im Jahre 1973 erscheinen soll, - möglichen die das zeitliche Ausmaß der Probekapitel bis zum Ende des Jahres. Die ersten Kapitel sind bis 31. 3. 74 als Termin für die Abgabe des Manuskriptes an den Verlag in der 73. 74. Auflage zu liefern, was uns Herr Prof. Sachs die Abgabe bestätigen. Wir hoffen, daß Sie diesen wichtigen Auftrag zu erfüllen gelingt und wir auf die Abgabe des Manuskriptes im Juni 1974, und hoffen auch Herrn Prof. Sachs bitten, uns eine Bescheinigung darüber mitzuteilen.

Wir werden Ihnen auch dankbar sein, wenn Sie uns mitteilen können, ob eine Bescheinigung über die Abgabe des Manuskriptes an den Verlag einzureichen. Wir werden Sie zum Verkauf in der DDR - oder während eines Aufnahmestandes Bescheinigung zum Verkauf von Büchern - zurückzustellen wünschen.

Wir sehen Ihrer Rückmeldung gern entgegen und verbleiben

mit vorzüglicher Hochachtung  
und freundlichen Grüßen

VUB DEUTSCHLAND WILHELM DER WILHELM-STRASSE

Dr. J. J. J. J.  
VUB DEUTSCHLAND WILHELM DER WILHELM-STRASSE

PROF. DR. HORST SACHS

63 ILMENAU  
AM WENZELSBERG 12  
TELEFON 3317

Ilmenau, 5.2.74

Lieber Herr Cvetkovic!

Habe diese Tage von Ihnen viel Post erhalten. Einen langen Brief vom S. d. mit Manuskripten und Sonderdrucke, die angefordrigsten Bücher von Mayesic und Harvey (ed.) Ihr Einladungsschreiben vom 22. 1. und außerdem eine Einladung

Herrlich  
für  
Horn  
Pauls

von V Popović, ebenfalls vom 22. 7.  
für all das möchte ich Ihnen recht, recht  
herzlich danken! - Gegen-  
wärtig sind Preisfragen, da bleibt  
gar keine Zeit, aber zum Wochen-  
ende werde ich Ihnen einen aus-  
führlichen Brief schreiben.

Der Verlag "D.V.W." teilt mit, dass  
bei "AP" nach ein vor großes Interesse  
besteht, und ich soll schließlich ein  
Probekapitel schreiben!

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Zagreb 21. II 1979.

Dragi Dragoš

Hvala na pismu od 15. II. Na njega odgo-  
varam na brzini jer sam vrlo zauzet. Jedan od  
razloga za to je i što mi se 12. II rodila kćerka  
Barbara. (Sada se trudim 3-4 puta <sup>svake</sup> noći.)

Rado ću pomoći oko kompletiranja knjige, ko-  
liko mi mogućnosti budu dozvolile. Također ću na-  
pisati i primjer za "kemijsku" faktORIZACIJU poli-  
noma. Zato te molim da mi odmah pošalješ  
knjigu (mislim) Hochstrasser-a (na ruskom). Knjigu  
ću Ti vratiti zajedno s rukopisom.

Što se tiče dolaska u Belkanski kongres,  
susreta sa Leksom i Hanaryjem, sve će to pasti u  
vodu kada odem u JNA. Ostanem li civil u to  
doba (verovatnoća  $\rightarrow 0$ ) doći sa sigurnošću. Ali, zbilja  
ne vjerujem u tu mogućnost.

Za matematički članak o klasi B znaš  
moje mišljenje. Jedino bih Te molio, ako je to  
moguće, da sve one planove u kojima i ja igram  
ulogu odložiš za ~ 1 godinu. Po povratku iz vojne  
aktivnosti radiću na ovom projektu. Hvala



hom, valda je kod matematičara i običaj da se rezultati neko vreme dože u fisci. Moji rezultati na "proširenju" Descartes-ove teoreme su sigurno tek početak i mogućnost za dalja istraživanja. Ne znam da li ~~je~~ sam Ti to jasno napisao - do rezultata sam došao "probajem", a dokaz je došao posle.

Na kraju (a trebalo je to da dođe na početak) NAŠ RAD "GRAPH-THEORY AND MOLECULAR ORBITALS. IX: ON THE STABILITY OF CATA-CONDENSED HYDROCARBONS" je prihvaćen u uglednom Theoretica Chimica Acta. ! Ta vest je stigla danas.

Pozdrav  
Joan

Očekujem najavljene materijale / rukopise

Jlmenow, 24.2.74

Lieber Herr Cvetković!

Endlich komme ich dazu, Ihnen zu schreiben:

Ich bin schon ganz verzweifelt, aber es war in den letzten Wochen wie verhext, immer, wenn ich einen Anlauf nahm, um Ihnen zu schreiben, kam eine andere, unaufschiebbare Pflicht dazwischen. Deshalb bitte ich Sie freundlichst um Ihr Verständnis.

Ich habe mich nun für so viele Dinge zu bedanken: Die Bücher von Mayeda und Harary (ich schrieb Ihnen schon kurz, daß ich sie erhalten habe), für die ich Ihnen besonders dankbar bin (bitte, zögern Sie nicht und schreiben Sie mir sofort, wenn ich irgend Bücher, die hier erscheinen sind, Ihnen schicken kann!), Ihren langen Brief vom 8.1.74, Ihren Brief und Ihre Einladung vom 22.1.74, die Einladung

von Herrn Popović vom 22. 1. 74  
(bitte, wollen Sie Herrn Popović vorab  
ganz persönlich meinen herzlichsten  
Dank übermitteln; natürlich werde  
ich auch selbst an ihn schreiben)  
sowie Ihren Brief vom 7. 2. 74 und  
das Manuskript von Kapitel 6 des  
Buches! Für alles noch einmal: ( )  
Recht herzlichsten Dank!

Inzwischen beginnt nun der Verlag  
zu mahnen und verlangt das (schon  
lange überfällige) Probe-Kapitel von  
mir (ich nehme an, daß auch Sie  
einen Brief vom DVW erhalten haben?).  
Ich habe nun alle Unterlagen bereit  
gelegt, um endlich ernsthaft an die  
Arbeit zu gehen, und ich denke, es  
muß in den nächsten Wochen bei mir  
entscheidend vorangehen - wenn nur  
nicht wieder so viele Störungen (Krank-  
heit u. s. w.) dazwischen kommen!

Zunächst einmal steht noch die Haupttagung der Math. Gesellschaft der DDR, die im Mai stattfindet, mit ihrer umfangreichen Vorbereitung (ich soll auch einen längeren Vortrag halten) auf dem Programm. Deshalb bin ich Ihnen so sehr zu Dank verpflichtet, daß Sie den Hauptteil der Arbeit übernommen haben und mir noch weiter helfen wollen, so daß ich eigentlich gar kein Recht habe, mich als „Mitautor“ zu betrachten. - Also, wie gesagt, ich werde mir die allergrößte Mühe geben, um endlich meinen Beitrag zu leisten. Abgabetermin für das Manuskript ist der 30. Juni 1974!

Bitte, sagen Sie auch Herrn Gutman in meinem Namen vielen Dank für seine Einladung. Ob es mir möglich sein wird, am Kongress in Belgrad teilzunehmen, ist bisher ganz ungewiß,

und dasselbe gilt natürlich für Prag.  
Sobald ich etwas Definitives wisp,  
werde ich sofort von mir hören  
lassen.

Lieber Herr Cvetković, recht vielen Dank  
für die Arbeit von Herrn Simić und  
den Hinweis auf den Fehler in meinem  
Buch: In der Graphentheorie kann  
man nicht vorsichtig genug sein!  
Man lernt da eben nie aus, und  
ich ärgere mich sehr, daß ich das nicht  
bemerkt habe. Zum Glück ist der Fehler  
nicht schwerwiegend und kann, wie  
mir scheint, leicht behoben werden, z.B.  
wenn man in der letzten Zeile auf  
Seite 80 hinter  $C'$  einfügt: "Jedes  
der äußeren Geradenpaare habe genau 2  
Randknotenpunkte auf  $C'$ ." Man  
muß bei den allgemeinen Betrachtungen  
eben immer sehr darauf achten, daß  
nicht etwa unerwünschte Koinzidenzen  
eintreten, die dann besonders behandelt  
(oder ausgeschlossen) werden müssen.

Die immer in Eile

prüft sie recht herzlich

Herz

Herrn Vocher

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Zagreb, 4.3.1974.

Dragi Dragoš.

Primio sam kopije poglavlja 8.1 i 8.2 iz Tvoje knjige i pročitao ih. Imao bih samo manje (uglavnom tehničke) primedbe.

0. Nekoliko jezičkih (gramatičkih i pravopisnih) grešaka koje sam uočio nisam naveo jer ni sâm nisam jak u engleskom. U svakom slučaju, sugerirao bih da rukopis prođe kroz pažljivu jezičku korekturu.

Primedbe označene zvezdicom se verovatno javljaju samo u mojoj kopiji rukopisa; naveo sam ih za svaki slučaj.

## Primedbe na poglavlje 8.1

1<sup>\*</sup>.str.2, Fig.1

fali jedna C-C veza u formuli

2. str.2, 6 red od dole

treba: p-electron

(Atomi imaju p-elektrone. Njihovom kombinacijom u molekulama nastaju  $\pi$ -elektroni. To je opšte korišćena nomenklatura. U stvari, slova s,p,d,... označavaju određenu simetriju atomskih orbitala, a molekularne orbitale  $\sigma, \pi, \delta, \dots$  imaju analognu simetriju.)

3. str.3, 4 red od dole

treba: determining molecular orbital energies...

4<sup>\*</sup>.str.4, 13 red od gore

treba:  $\sigma$ -electron bonds

## Primedbe na poglavlje 8.2

5. str.1, 4 pasus "Every spanning linear..."

Obzirom na teškoće koje smo mi imali da uočimo ovu jednostavnu relaciju, možda bi se tvrdnja u pasusu mogla izložiti malo opširnije. Time bi se verovatno čitaocu olakšalo čitanje ovog dela teksta.

6. str 1-2

trebalo bi, možda, citirati rad C-17.

7.\* str.6, 11 red od gore  
treba:  $(-1)^y K^2$

Primedbe na literaturu

C-3,C-4

treba: Heilbronner

C-16

za sada znamo: J.Chem.Phys. 61 (1974)

C-17

Croat.Chem.Acta 45 (1973) 539-546.

C-18

Chem.Phys.Letters 24 (1974) 283-285.

C-20

Ovaj rad niti formalno niti suštinski ne koristi teoriju grafova (rezultati se pretežno zasnivaju na teoriji grupa), niti su dobiveni rezultati relevantni za teoriju grafova; predložio bih ne citirati ga.

---

Naročito me je oduševljavalo poglavlje 8.2. Tu sam prvi put vidio "naše" probleme (stare već preko 20 godina) o vezi  $\det A$  i  $K$  izložene na potpuno egzaktn način. Biće sada zanimljivo kako će drugi matematičari reagirati na ovo.

Imao bih samo jednu primedbu, koja je i Tebi sigurno poznata, a koja je inače napomenuta u radovima C-16 i C-17. Naime, sve izrečene tvrdnje o parnosti faktora i separacijâ te teorem 8.8 važe za sve grafove.

Pasus 4 na str. 1 može se, u stvari, poopštiti kao: "Let  $H$  be an arbitrary graph. Every spanning linear subgraph of  $H$  without odd cycles can be ..." dalje sve isto do kraja pasusa. ovo omogućava da se uvođenjem skupova  $S_{\text{even}}$  i  $S_{\text{odd}}$  poopšti teorem 8.9, te iskaz o permanentu (v.C-17).

Zanimljivi su grafovi sa  $S_{\text{odd}} = \emptyset$  ili još opštije, grafovi za koje je (u našim oznakama!)

$$\sum_{s \in S_{\text{odd}}} (-1)^{c(s)} = 0$$

Za njih važi teorem 8.9.

Rukopis o primeni simetrije kog grafova pripremam i, verovatno ću ga moći poslati na vreme. Rad o određivanju broja  $N_+$ ,  $N_0$  i  $N_-$  je prihvaćen u Chem.Phys.Letters.

Srdačni pozdravi

*Ivan*

# »RUĐER BOŠKOVIĆ« INSTITUTE

41001 Zagreb, Croatia, Yugoslavia

POB 1016  
PHONE: (041) 424-355  
TELEX: 21-383

Zagreb, 6.3.1974.

Dragi Dragoš.

Šaljem Ti rukopis o korištenju simetrije, kao što se to radi u kemijskoj fizici. Trudio sam se da dam i teoreme iz teorije grupa, koji su relevantni.

Namerno sam išao u detalje na nekim mestima i dva, pa i više puta ponavljao iste tvrdnje. Rešio sam i nekoliko primera, koji se, nadam se, međusobno dopunjuju i potpuno ilustriraju "naš" postupak. Akcentirao sam ona mesta gde se dobivaju baš Sachsove orbite.

Literaturu za citiranje mogu preporučiti samo ono što je citirano bilo u knjizi Hochstrassera ili u knjizi Philipsa. Knjiga "Simetrija u fizici čvrstog stanja" (na ruskom), koja je također kod Tebe, pored dobre literature sadrži i originalne članke (Wiegnera i dr.).

Rado ću, ako mi prilike to dozvole, pomoći i u daljem radu. Specijalno, ako nešto nije sasvim jasno, rado bih to, ako i sam znam, razjasnio.

Na kraju imao bih jedno pitanje., a koje je iskrslo prilikom pisanja ovog rukopisa:

Da li uopšte postoji regularan graf sa trivijalnom grupom automorfizama ?

Ako postoji, navesti primer.

Srdačni pozdravi

*Jovan*



14.3.1974

VEB DEUTSCHER VERLAG DER  
WISSENSCHAFTEN  
108 Berlin  
Johannes-Dieckmann Strasse 10  
Postfach 1216

Dear Sirs,

Thank you for your kind letter of 31.1.1974. I apologize for replying you with such a delay; in the meantime I have consulted Professor Sachs.

Elaboration of my part of the manuscript for the book "Graphs and their spectra" is nearing the end so that I am accepting the date 30.6.1974 as the date for manuscript submission. At present everything depends upon Professor Sachs. He informed me that he hopes to complete his part of the work up to the fixed date provided the state of his health is satisfactory. That is why I am most kindly asking you to fix the definitive date for the manuscript together with Professor Sachs. He will, probably, very soon give you a part of the manuscript so that you may look through.

I wish to inform you that in principle I am willing to leave a part of author's fees for the use in GDR. Please let me know the absolute amount of my fees (approximately for 200 pages) so that I may decide which part to leave in GDR. Will the remaining part of the fees be paid in hard currency or in clearing dollars?

Yours sincerely

Dragoš Cvetković

Jmmann, 27. 3. 74

Lieber Herr Cvetković!

Heute übersende ich Ihnen, um keine Zeit zu verlieren, den Teil des Manuskripts (Abschnitte 2.5 und 2.6), den ich als „Probekapitel“ dem Deutschen Verlag der Wissenschaften übergeben habe. Auf Fragen inhaltlicher Art will ich dann in meinem nächsten Brief - sobald ich Zeit habe - näher eingehen.

Lieber Herr Cvetković, recht vielen Dank für Ihre Briefe vom 27.2. und 6.3.74! Ich habe jetzt endlich eine Schreibkraft gefunden, und so bin ich dabei, die einzelnen Teile des Manuskripts (von Ihnen) für die Reinschrift vorzubereiten: Mit der Schrift, insbesondere der Formeln, kann man ja wirklich sehr zufrieden sein. Ich hoffe, daß Sie keine Einwände haben, daß ich an einigen Stellen

Ihre Formulierungen in sprachlicher Hinsicht etwas abgeändert habe. Herr Arnold war mit dieser Form des Manuskriptes auch recht zufrieden.

Indem ich so rein zwangsläufig den Inhalt Ihrer Teile des Manuskriptes kennen lerne, habe ich gleichzeitig die beste Vorbereitung für diejenigen Teile, die ich noch selbst schreiben muß. Allerdings stelle ich wieder fest, daß mir die Zeit nur so fortläuft...

Die Bilder können Sie, wenn Sie eine Zeichnerin haben, mit Tusche vorzeichnen lassen, oder auch nur deutliche Skizzen auffertigen und ich lasse die Zeichnungen dann hirt machen, das ist vielleicht sogar besser, weil dann Ihre und meine Bilder die gleiche Form bekommen. Ich möchte annehmen, daß der Verlag ohnehin alles gemäß seinen Normen noch einmal zeichnen läßt.

Ich war am 21. 3. in Berlin und habe mich mit Herrn Arnold gründlich ausgesprochen. Ihm geht es nun zwei Dinge:

1) Er möchte Material haben, damit der Draht zu AP nicht abreißt. Dafür werde ich jetzt sorgen. Im Übrigen drückt uns der DVW keine Termine, obwohl er (wie auch wir) natürlich alles gern bald erledigt haben möchte, schon damit AP das Interesse nicht verliert. In jedem Falle bleibt die Zusage, daß der DVW das Buch herausbringt (in englischer Sprache, so wie konzipiert), und zwar mit oder ohne AP, bestehen.

2) Der Verlag fühlt sich Ihnen gegenseitig verpflichtet, daß Sie ja bereits den größeren Teil des Manuskripts vorgelegt haben, und er möchte deshalb bald zu einem Vertragsabschluss kommen (mit Ihnen), aber natürlich ist es ihm lieber,

das zu tun, wenn das Manuskript  
komplett ist (der Verlag hat es von  
sich aus nicht eilig). Das Honorar  
wird üblicherweise in der Währung des  
Landes gezahlt, in dem der Autor  
lebt (für Sie also in Dinar), wobei  
es eventuell möglich ist (wegen der  
Beteiligung eines amerikanischen  
Verlages), einen Teil in Dollar zu  
zahlen (falls Sie das wünschen)  
(und natürlich auch in Mark).

Über die Aufteilung müssten wir uns  
noch einigen, wobei ich der Meinung  
bin, daß eigentlich Ihnen alles  
zusteht, denn ich habe Sie mehr  
gehemmt als unterstützt. Über  
die Höhe des Honorars bekam ich  
folgende Angaben: Bei 400

Manuskriptseiten und einer Auflage  
von 1500 Exemplaren (das könnte  
höher sein, das hängt von AP ab)  
wird der Ladenpreis des Buches  
50 bis 60 Mark betragen; das

Honorar beträgt pro Buch 10% vom Ladenpreis, also insgesamt etwa 1500 mal 5 Mark

Ich habe die Genehmigung für die Teilnahme am Balkan-Kongress beantragt und zugleich um eine Woche Urlaub gebeten, um im Anschluß an den Kongress die Einladung von Herrn Popović wahrnehmen und insbesondere mit Ihnen über das Buch sprechen zu können; Ich hoffe sehr, daß ich die Genehmigung erhalte, so daß wir uns Ende Juni mit etwas mehr Ruhe unterhalten können.

Das Buch von Vop und Walther ist noch immer nicht erschienen - selbstverständlich schicke ich Ihnen sofort ein Exemplar.

Lieber Herr Cretković, ich melde mich bald wieder. Dieser Brief soll noch schnell zur Post kommen.

Es grüßt Sie ganz herzlich

Herr Hans Lecler

Dragoš Cvetković

29.3.1974

Chairman of the  
Research Fellowship Committee  
Eindhoven University of Technology  
Post Box 513  
Eindhoven  
The Netherlands

Dear Sirs,

I have been informed that your university grants researchh scholarships in 1974/75. Since I am interested in obtaining your scholarship, please send me the detailed data about it.

Let me introduce myself. I am a mathematician, with a Ph.Degree; my speciality is graph theory. I am working on matters similar to those of Prof. J.J. Seidel with whom I am in touch. I use German and English languages. I am working as an Assistant Professor at the Faculty of Electrical Engineering.

Looking forward to your news,

Yours sincerely

Dragoš Cvetković

Zagreb, 3.4.1974.

Dragi Dragoš.

Prvo da Ti javim radosnu vest: naš rad u Croatica Chemica Acta je dobio pozitivne recenzije i prihvaćen je za štampu. Možeš ga referirati (za sada) kao Croat.Chem.Acta 46 (1974) in press. Na zathev jednog recenzenta moraće se izbaciti Appendix i zaminiti nekom referencom. Molio bih Te, zato da mi javiš (i to, ako je moguće brzo) naslove nekoliko knjiga, po mogućnosti na engleskom, koje bi se mogle navesti kao izvor za formulu izvedenu u Appendix-u. Recenzenti nisu imali drugih bitnih primedbi.

Kao što vidiš, izgleda da svi radovi u kojima si Ti koautor "prolaze glatko" recenzije. Naravno, to nije slučajno, ali nas ne sme "uljuljkati" u daljem zajedničkom radu.

Trinajstić je, u međuvremenu, napisao drugu verziju rukopisa (koji je namenjen kemijskoj publici). Sada se rukopis nalazi na čitanju kod Živkovića. Trina se u međuvremenu vratio iz Engleske, tako da ćemo ubrzo pripremiti i treću verziju, koja bi mogla da bude i konačna. O tome ćemo Te još obavestiti.

Trinajstić je javio da u Beograd dolazi Harary. Verovatno ćemo nas nekoliko za tu zgodu skoknuti do njega. Ipak, molio bih Te da javiš detalje o njegovom dolasku.

U vojsku neći ići prije juna. To ima izvesne posledice na moje planove. Specijalno, pok.šao bih da dođem na Balkanski kongres matematičara. Molio bih Te da isposluješ da mi organizatori pošalju potrebne podatke o kongresu.

Takođe bih želio doći u Beograd na nekoliko dana, ali to je još samo želja, jer bih prethodno trebao dobiti "blagoslov" šefova. Ako bi to uspelo, svakako bi trebalo da razgovaramo.

Srdačni pozdravi

Jvan



# TECHNISCHE HOGESCHOOL EINDHOVEN

POSTBUS 513 TEL (040) 47 91 11 (Doorkiesmogelijkheid via 47 2.240) G.I.R.O.R.F.K.E.N.I.N.G 107 63 26 - BANKIER F. VAN LANSCHOT EINDHOVEN

Dragos Cvetković,  
Department of Mathematics,  
Faculty of Electrical Engineering,  
University of Beograd,  
P.O. Box 816,  
11.001 BEOGRAD,  
Yugoslavia.

UW BRIEF

LETTER EN NUMMER

EINDHOVEN, INSULINDELAAN 2

April 9th, 1974.

ONDERWERP

In reply to your application for a research-fellowship I am sending you herewith an application form.

Your letter was received after closing the period in which application was possible.

Hence your application will be transferred to the academic year 1975-1976.

Prof.dr.ir. G. Vossers  
Chairman of the Research  
Fellowship Committee.

*i/o*  


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Zagreb, 11.4.1974.

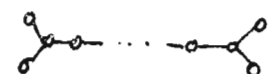
Dragi Dragoš.

Hvala na pismu od 8.4. U međuvremenu sam pripremio dodatke koje bih predložio da uđu u vašu knjigu. Kada to bude moguće, volio bih da mi javiš naslov knjige, izdavača itd. da bi vašu knjigu mogli da citiramo.

Nedavno sam dobio sledeće rezultate, koji će Te možda zanimati:

1. Graf  sa n+2 čvora zvaću Z<sub>n</sub>. Njegov spektar je:

$$S(Z_n) = \left\{ 2 \cos \frac{(2k+1)\pi}{2(n+1)} \mid k=0,1,\dots,n \right\} \cup \{0\}$$

2. Graf  sa n+4 čvora zvaću W<sub>n</sub>. Njegov spektar je

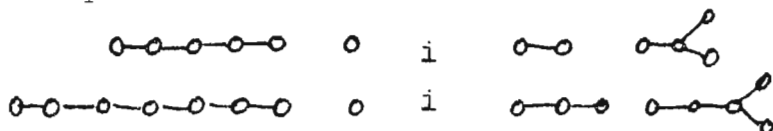
$$S(W_n) = S(L_n) \cup \{0,0,+2,-2\}$$

gde S(L<sub>n</sub>) označava spektar lanca duljine n.

3. Spektar lanca duljine 2n+1 sadrži spektar lanca duljine n i spektar grafa Z<sub>n</sub> izuzev jedne nule:

$$S(L_{2n+1}) = S(L_n) \cup S(Z_n) - \{0\}$$

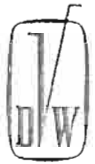
To, između ostalog, znači da grafovi L<sub>2n+1</sub> ∪ L<sub>1</sub> i L<sub>n</sub> ∪ Z<sub>n</sub> čine PING. Na primer:



Izgleda da zbog finansijskih razloga moj skori dolazak u Beograd ozpada. Kada bude tu prof. Sachs a ako budem još civil, doći ću, makar i o vlastitom trošku.

Srdačni pozdravi:

*Iran*



108 BERLIN, JOHANNES DIECKMANN STRASSE 10  
Postfach 1216

Herrn  
Dr. D. Cvetković

11 000 B e o g r a d  
Lamartinova 44

Jugoslawien

Wp Zeichen	Ihre Nachricht vom	Unser Zeichen/Hausnr	Tag
		131/At/Hz	15.4.74

Bericht  
Graphs and their spectra

Sehr geehrter Herr Dr. Cvetković,

besten Dank für Ihr Schreiben vom 14.3. Inzwischen erhielten wir von Herrn Prof. Sachs anläßlich eines Aufenthaltes in Berlin ein Probekapitel (2.5 Nep's and Boolean Functions), das wir bereits an den Verlag Academic Press weitergeleitet haben.

Mit Herrn Prof. Sachs haben wir uns weiter dahingehend geeinigt, daß wir die Verträge erst im Anschluß an Ihr gemeinsames Treffen Ende Juni in Beograd ausfertigen, da Herr Prof. Sachs voraussichtlich erst zu diesem Zeitpunkt überblicken kann, wann seine Arbeiten zum Abschluß kommen werden.

Mit Herrn Prof. Sachs haben wir auch vereinbart, daß wir zunächst darauf verzichten wollen, bei Vertragsabschluß für Sie einen Betrag zum Verbrauch in der DDR festzulegen. Wenn Ihrerseits dieser Wunsch bestehen sollte, könnten wir auch noch zu einem späteren Zeitpunkt Ihre Bitte erfüllen. Anläßlich Ihres Treffens mit Herrn Prof. Sachs können Sie vielleicht noch einmal diesen Punkt des Vertrages besprechen.

Nach vorläufigen Schätzungen dürfte das Autorenhonorar insgesamt etwa bei 6.000,- M liegen, wovon die gesetzlichen Steuern in Höhe von 20 % abgezogen werden. Dieses Honorar wird entsprechend dem jeweiligen Arbeitsanteil zwischen Ihnen und Herrn Prof. Sachs aufgeteilt. Über die Wahrung Ihrer Autorenrechte wacht bei uns in der DDR das Büro für Urheberrechte, das auch die Transferierung Ihres Honoraranteils in Ihre Landeswährung vornimmt. Sollte sich jedoch der Verlag Academic Press an dem Publikationsvorhaben beteiligen,

Telefon 22900

Telegrammankündigung: Devauwe Berlin - Kontu - Berliner Stadtkontor der HfB, 108 Berlin, Behrenstraße 35/39, Konto-Nr. 6651 16-627  
PSdA Berlin, Konto-Nr. 21827

BN 90130937

Blatt 2 zum Schreiben vom 15.4.74 an Herrn Dr. Cvetković, Beograd

dann dürfte es unter Umständen möglich sein, Ihnen einen Honoraranteil in US-Dollar zu zahlen. Wir möchten uns jedoch erlauben, Sie darauf aufmerksam zu machen, daß Ihr Land von dem Ihnen überwiesenen Betrag ebenfalls Steuern einbehält. Über die Höhe dieses Abzugs kann Ihnen sicher Ihre Bank Auskunft geben.

Mit vorzüglicher Hochachtung  
und freundlichen Grüßen  
VEB DEUTSCHER VERLAG DER WISSENSCHAFTEN

Dr. Walter  
Verlagsleiter

Arnold  
Abteilungsleiter

# »RUĐER BOŠKOVIĆ« INSTITUTE

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Zagreb, 16.4.1974.

Dragi Dragoš.

Neočekivano, Institut je rešio da "odreši kesu" za jedno moje putovanje u Beograd. Tom prilikom bih, prvenstveno, želio da razgovaram s Tobom. Mislim da će tema<sup>^</sup> za razgovor biti dovoljno. Specijalno, možemo obaviti niz poslova oko Tvoje knjige.

Da li bi Ti odgovarala sreda i četvrtak 7. i 8. maja ?

Pozdrav

*Jovan*

VEB DEUTSCHER VERLAG  
DER WISSENSCHAFTEN



Herrn

Dr. D. Cvetković

11 000 B e o g r a d

Lamartinova 44

VEB Deutscher Verlag  
der Wissenschaften  
DDR - 108 Berlin  
Johannes-Dieckmann-Straße 10  
Postfach 1216

377 BwG 003/73 4 329

Jemenan, 6. Mai 1974

Lieber Herr Cvetković!

Ende der Woche erhielt ich gleich zwei Sendungen aus Beograd: Ihren Brief vom 9. April mit den Abschnitten 7.6, 7.7, 8.3 sowie Tafeln und Ihre Arbeit "Spectrum of the total graph of a graph" und vom Institut das Buch "a survey of combinatorial theory", über das ich mich ganz besonders gefreut habe! Für alles möchte ich Ihnen recht, recht herzlich danken! Leider bin ich wieder aus der Arbeit am Buch herausgerissen worden: Ich war ein paar Tage krank, und jetzt habe ich die Haupttagung unserer Mathematischen Gesellschaft vor mir, die alle meine Kraftreserven in Anspruch nehmen wird. Mit den Angelegenheiten des Buches werde ich mich erst wieder nach dem 20. Mai (und dann hoffentlich etwas intensiver) beschäftigen können. Deshalb will ich auch jetzt nicht auf die einzelnen Fragen eingehen. Was die Tabellen betrifft, die wir übernehmen wollen, so ist es sicher nicht verkehrt (und

in jedem Falle höflicher), wenn wir die Verfasser um die Genehmigung des Abdruckes der Tabellen bitten.

P.S. Ich habe neben meine Anmeldung „unter Vorbehalt“ zum Kongress an Prof. Kurepa geschickt; die Lage ist so: Für mich wurde eine Studienreise im Rahmen des Freundschaftsvertrages zwischen der TH Jelenau und der Universität Niš beauftragt, und nur wenn der Antrag genehmigt wird, kann ich am Kongress teilnehmen. Für den Fall der Genehmigung sieht mein Zeitplan wie folgt aus: 18. oder 19. Juni: Anreise in Niš, 23. oder 24. Juni: Anreise in Beograd, Teilnahme am Kongress und Aufenthalt in Beograd bis zum 8. Juli. Ich freue mich sehr auf das Wiedersehen und vor allem auf die Möglichkeit, dann intensiv am Buch zu arbeiten! Lieber Herr Cvitković, ich danke Ihnen sehr, daß Sie meinen Aufenthalt so schön machen wollen - aber von größeren Reisen sollten wir doch lieber absehen, denn wir werden die Zeit für das Buch brauchen (für mich eine wunderbare Gelegenheit, ungestört zu arbeiten!) und ich hätte am schönsten Bordestrand keine Ruhe, wenn es mit dem Buch nicht vorangeht. Sicher gibt es auch in der Nähe von Beograd einen hübschen Ausflugsort für das Wochenende!

Mit Ihrem Vorschlag, alle Fragen des Honorars und des Vertragsabschlusses in Beograd zu besprechen, bin ich sehr einverstanden.

Hoffentlich werden wir uns treffen!  
Es grüßt Sie und Ihre lieben Angehörigen,  
auch im Namen meiner Frau

Ihr  
Herr Sachs

P.S. Ich höre, daß das Buch von Valters und Voss dieses Tage an den Handel eingekauft worden sei, aber ich habe noch kein Exemplar gesehen. - Voraussichtlich werde ich zusammen mit Prof. Branninger nach Niš und Beograd kommen



# INSTITUTE "RUĐER BOŠKOVIĆ"

BIJENIČKA 54. ZAGREB, YUGOSLAVIA

LETTERS: P. O. B. 171

TELEGRAMS: INSTRUBO, ZAGREB

ZAGREB, 13. 5. 74

Dragi Dragoš

Šaljem Ti obećane kopije i  
pisma. Pored toga šaljem Ti i neke jednostavne  
rezultate u vezi "rekonstrukcije" karakterističnog  
polinoma grafa iz karakterističnih polinoma pografova.  
Svestan sam da su to uglavnom "trivijalni"  
rezultati, ali sam ih sakupio za svaki slučaj.

Pozdrav  
Ivan

Zagreb, 15.5.1974.

Dragi Dragoš.

Javljam Ti vest koja je još "vruća": U JNA ću biti pozvan u septembru. Prema tome imaću (izgleda) dovoljno vremena da završim niz započetih projekata. Što se tiče mogućnosti da budem pozvan u Beograd - sada znaš dokle sam slobodan.

Šaljem Ti jedan svoj rukopis, i ako bi ga pročitao i dao svoje komentare, bio bih vrlo zahvalan. Također šaljem i fotokopiju jednog mog rada koji se nedavno pojavio (separate nećemo dobiti). Taj rad je u potpunosti ušao u moju disertaciju.

Kada se s Trinom dogovorim za detalje rada do kraja leta, javiću se ponovo. Tvoj prilog o broju nula u spektru ću svakako ubaciti u rukopis rada. Inače, rad o izospektralnim grafovima (Randić, Trinajstić, Živković) dobio je više negativne nego pozitivne recenzije iz J.Amer.Chem.Soc.

Srdačni pozdravi

Ivan

Zagreb 23 V

Dragi Dragoš

Hvala na poslanim radovima. Sve sam ih iskopirao a sada treba "samo" da ih čitam.

Što se tiče našeg eventualnog zajedničkog rada o rekonstrukciji karakterističnog polinoma, drago mi je da si našao nešto interesantno u mojim rezultatima. I meni bi odgovaralo da se konsultiramo 18. VII. Radio sam i dalje na tom problemu ali bez uspeha.

Ona notica koju sam ti poslao puna je grešaka. Naime, priliku tipkanja na mnogo mesta + je zamenu sa -. Kriva je moja brzoletost.

Izdajući pozdravi

Joan

Jena, 5. 6. 74

Lieber Herr Cvetković!

Ihre Sendung vom 17. 5. (Abschnitt 8.4 etc) habe ich erhalten: Dafür und für den Brief recht herzlichen Danke! Zunächst eine sehr erfreuliche Mitteilung: Ich werde höchstwahrscheinlich (wenn ich das Visum rechtzeitig erhalte) am 19. 6. 74 zusammen mit Herrn Bräuning ~~z~~ um 13<sup>55</sup> h auf dem Flughafen in Belgrad eintreffen! Von dort geht es am selben Tage weiter nach Niš; auf welche Weise, das weiß ich nicht, das wird von den Kollegen in Niš arrangiert (mit dem Auto? Oder mit der Eisenbahn?). Lieber Herr Cvetković, ich weiß, Sie haben Herrn Harary zu betreuen, machen Sie sich deshalb bitte insofern keine Unstände und nutzen Sie die Zeit für Gespräche mit Frank (bitte, grüßen Sie ihn herzlich von mir!): Nur, wenn es sich zeitlich ganz ohne Mühe einrichten läßt,

PS: Noch vor der Tagung in Prag wie auch Paul Erdős für ein paar Tage besuchen, aber der genaue Termin ist noch nicht bekannt.

würde ich mich natürlich sehr freuen, Sie am Flughafen zu treffen und einige Einzelheiten mit Ihnen zu besprechen - aber ich kann natürlich auch von Nis<sup>v</sup> aus schreiben oder telefonieren. Vielleicht können Sie auch von den Kollegen in Nis<sup>v</sup> direkt erfahren, wie der Weitertransport erfolgt, so daß wir uns eventuell in der Stadt (nicht am Flughafen) kurz treffen könnten? Jedenfalls freue ich mich sehr auf die Reise, es wird schon alles gut gehen! Von Nis<sup>v</sup> kommend werde ich dann zusammen mit Herrn Bräuning am Kongress teilnehmen; anschließend fliegt Herr Bräuning zurück nach Berlin, während ich mich noch bis zum 7.7. in Belgrad aufhalten werde: Da gilt es dann, die Zeit zu nutzen und früchtig zu arbeiten! - Ich habe nun auch den Kongress der Math. Gesellschaft der DDR (1200 Teilnehmer!) hinter mir und bin nun nicht mehr Vorsitzender; Nachdem ich in der vergangenen Woche alle „Restbestände“ aufgearbeitet habe, bin ich jetzt dabei, wieder in Ihnen an Fuß zu fassen. Zu den Pfingsttagen mußte ich mich ein bißchen ausruhen, wir haben eine schöne Wanderung gemacht. Ihnen und Ihren lieben Angehörigen herzliche Grüße! Ihre Host Seubert

10.6.1974

Mr. J.J.Seidel  
Technological University Eindhoven  
Department of Mathematics  
POB 513 Eindhoven  
The Netherlands

Dear Professor Seidel,

Thank you very much for the papers which you forwarded to me. I would appreciate receiving in future too your new papers.

Please find enclosed herewith my recent papers. I would have two favours to ask from you.

1. Professor H.Sachs and myself are writing a book on graph spectra. The manuscript is to be finished this summer and it will practically involve all results on graph spectra including the applications in chemistry and physics. The publishers are Deutscher Verlag der Wissenschaften (Berlin,GDR), perhaps in cooperation with Academic Press. Professor Sachs and myself are asking you most kindly to permit us to include the tables from your paper (written together with J.H. van Lint) "Equilateral point sets in elliptic geometry".

Besides, I learned that you together with Prof. A.J. Hoffman write a book on graph spectra. Not wishing to appear too curious I would like to hear a few words about this project.

2. I recently learned that your University is granting research fellowships for foreign mathematicians dealing with graph theory. Having in view that a year spent beside you in the work would be very helpful for me, I addressed myself to the Committee for fellowships asking them for information on general conditions for getting the fellowship. From the documentation I obtained from them I could not get a clear idea about it. That is why I am most kindly asking you to let me know if you agree with my spending an academic year - 1975/76 - in work with you (provided I get a research fellowship). If you think that it is feasible please inform me which duties would expect me. Could I entertain my wife and a son (6 years old) from the fellowship? In that case I would bring them with me.

Thanking you in advance and looking forward to your news.

Yours sincerely

Đragoš Cvetković

»RUĐER BOŠKOVIĆ« INSTITUTE

41001 Zagreb, Croatia, Yugoslavia

POB 1016  
PHONE: (041) 424-355  
TELEX: 21-383

Zagreb 14. VI 74.

Dragi Dragiš

Zbog nastalih finansijskih testocia u našemu Institutu, doći ću samo ja u Beograd da prisustvujem predavanju prof. Harary-ja. Doći ću, verovatno, u utorak po podne ili uveče. Javiću Ti se čim stignem.

Ostaci i, najmanje 24 h po odlasku prof. Harary-ja, pa ćemo se dogovoriti o oba tada.

Pozdrav  
Ivan

P.S.

Dragi dragiš,  
Hvala Ti na pismu. Ja ne mogu doći u Bgd. zbog znanstvenih obaveza, ali Ti ćeš o radu razgovarati s Ivanom. Kao mi je propustiti Hararyja.

Srdacim pozdravi,

Menad

TECHNOLOGICAL UNIVERSITY EINDHOVEN - Department of Mathematics

PO BOX 513 - EINDHOVEN  
THE NETHERLANDS

Dr. D. Cvetković  
Department of Mathematics  
Faculty of Electrical Engineering  
University of Beograd  
P.O. Box 816; 11.001 BEOGRAD  
Yugoslavia.

EINDHOVEN,

June 19, 1974

Dear Dr. Cvetković,

Thank you very much for the reprints and the letter you sent to Prof. Seidel. Prof. Seidel is travelling in the months to come (he is in the U.S.A. till August 31, 1974), and is unable to write to you directly. However, I reassure you that he shall write when he has returned at the university in Eindhoven.

Sincerely yours,



Mrs. Harma Rooyackers-Koops,  
(secretary to Prof.dr. J.J. Seidel).



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Professor O.E. Polansky  
Max-Planck-Institut  
für Kohlenforschung  
Abteilung Strahlenchemie  
433 Mühlheim  
Stiftstrasse 34-36  
F.R. Germany

June 24, 1974.

Dear Professor Polansky,

Please find enclosed two copies of the manuscript:  
"Conjugated Molecules Having Integral Graph Spectra"  
by D. Cvetković, I. Gutman, and N. Trinajstić, which we  
would like to submit for publication in "Chemical Physics  
Letters".

In this work we give a graph-theoretical study of  
conjugated molecules with associated molecular graphs which  
have integral spectra.

It is shown using graph-theoretical arguments why only  
six molecules have integral HMO levels.

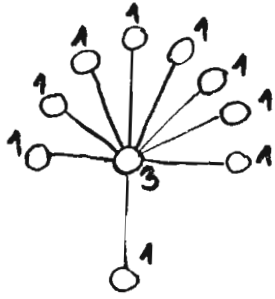
This work is a part of our effort to develop a general  
graphical method for organic molecules and we hope it  
may interest chemical community at large.

Looking forward to hearing from you, I remain

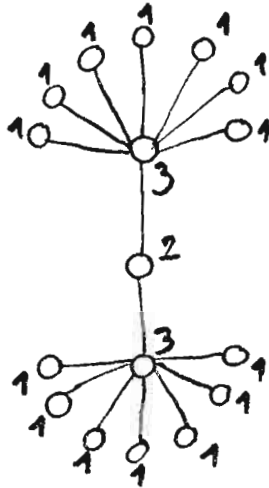
Sincerely yours,

  
Professor Nenad Trinajstić

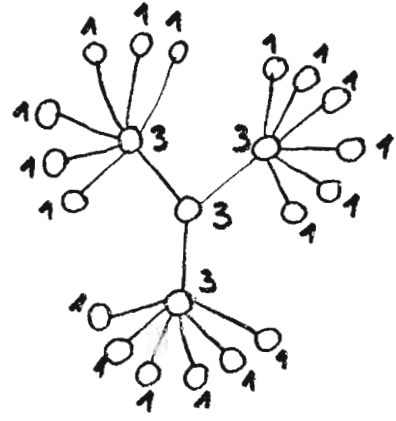
# FLOWERS



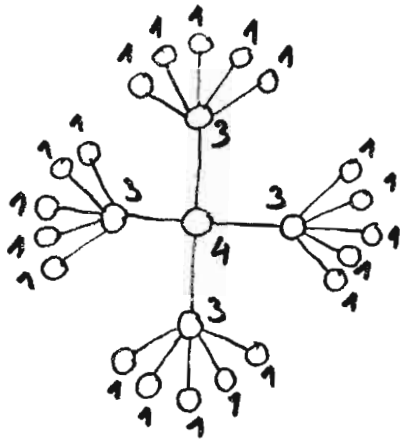
$F_1$



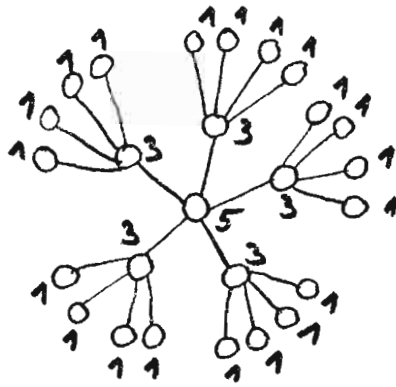
$F_2$



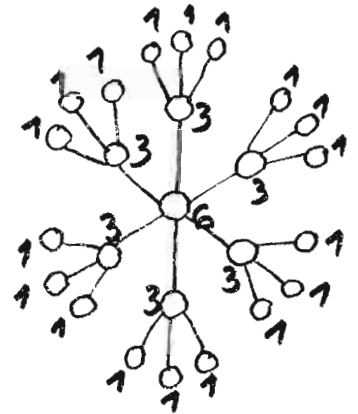
$F_3$



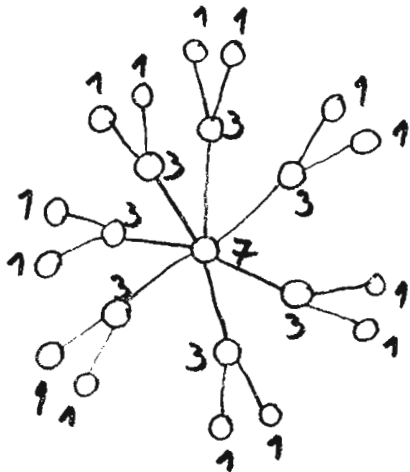
$F_4$



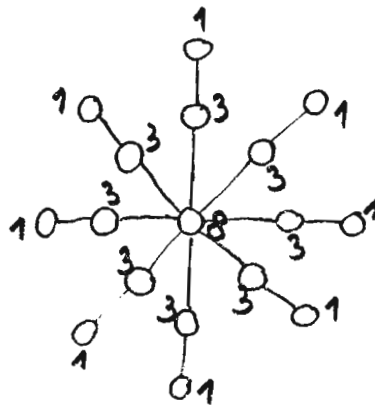
$F_5$



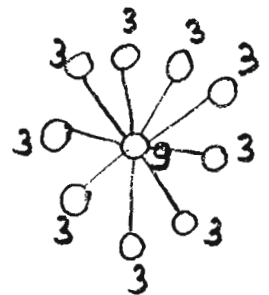
$F_6$



$F_7$



$F_8$



$F_9 \equiv F_1$

Zagreb, 29.6.1974.

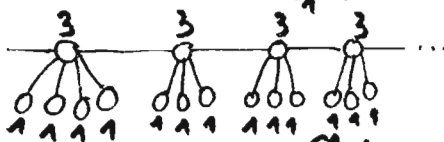
Dragi Dragoš

Našao sam "nekoliko" stabala koji imaju 3 kao maksimalni elemenat u spektru. Tih grafova ima beskonačno mnogo vrsta i ne može se sastaviti njihov spisak (poput spiska koji daje Smith).

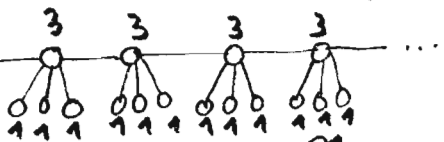
Na posebnom listu navedeni su grafovi "cveće". Brojevi označavaju komponente vlastitog vektora (čija je vlastita vrednost očigledno 3).


Sledeće operacije neće promeniti osobinu grafa da ima maksimalnu vlastitu vrednost jednaku 3:

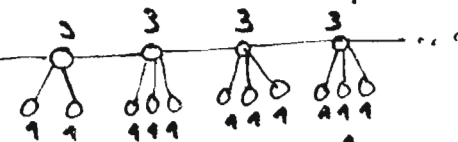
umesto (bilo koje) grane  u grafu  $F_2$  može se


staviti lanac 

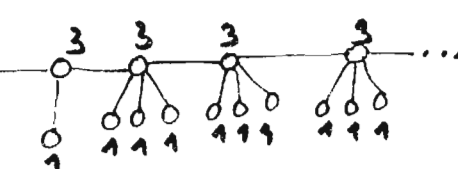
umesto (bilo koje) grane  u grafu  $F_3$  može se

staviti lanac 

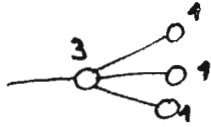
umesto (bilo koje) grane  u grafu  $F_4$  može se

staviti lanac 

umesto (bilo koje) grane  u grafu  $F_5$  može se

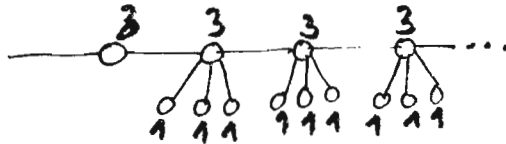
staviti lanac 

umesto (bilo koje) grane

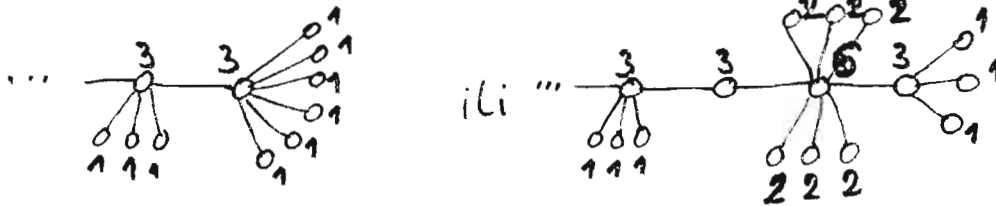


u grafu  $F_6$  može se

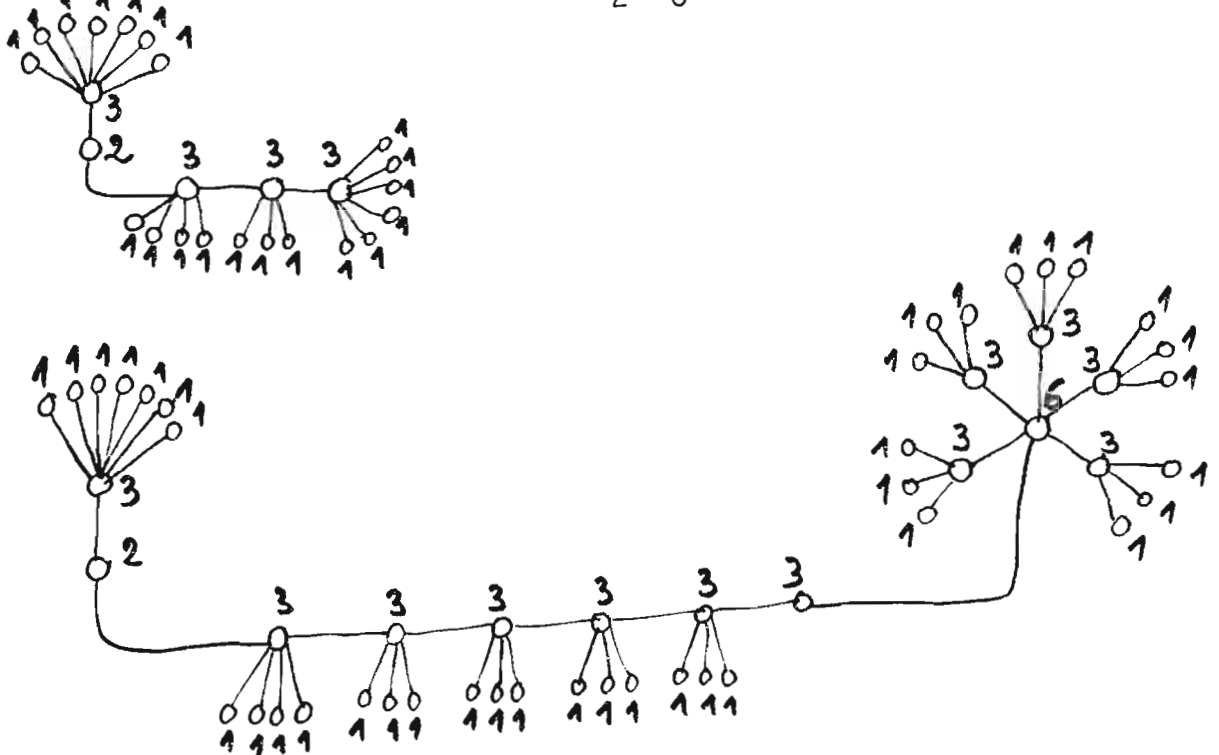
staviti lanac



Ovi lanci se ili mogu završavati sa, na primer:



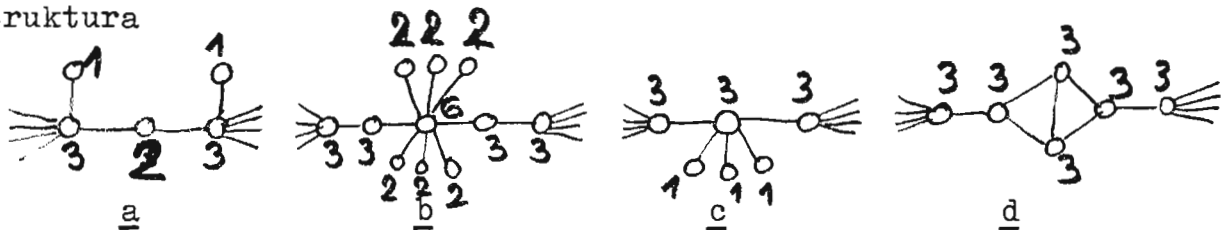
ili se mogu vezati na druge grafove  $F_2-F_6$ . Na primer:



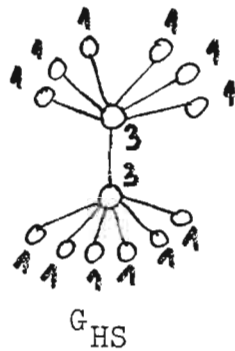
Treba primetiti da su u ovim grafovima često komponente vlastitog vektora na dva susedna čvora jednake 3:



Tada se između ovakvih čvorova može ubaciti neka od sledećih struktura

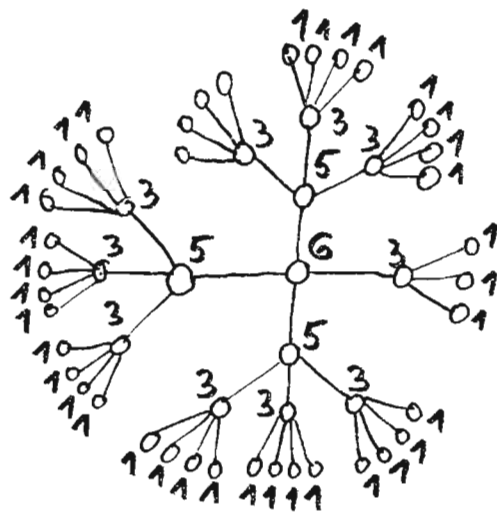


Napomena: primenom obrnute transformacije  $\underline{a}$  iz  $F_2$  se dobiva



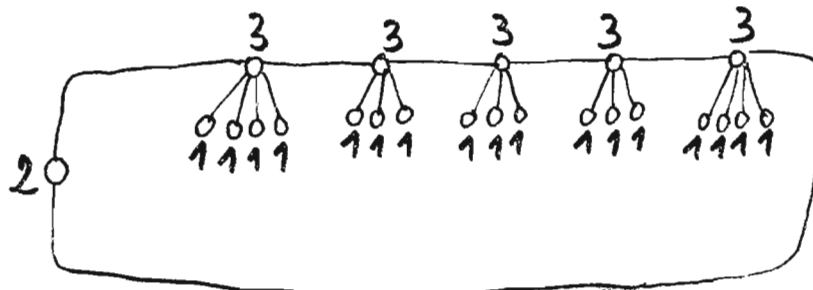
$G_{HS}$  se navodi u članku Harary-ja i Schwenk-a o integralnim grafovima.

Ovim nisu iscrpljene sve moguće kombinacije. Na primer, graf  $F_{56}$  je neka vrsta "hibrida" između cvetova  $F_5$  i  $F_6$ :

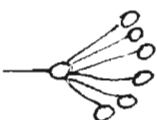


$F_{56}$

Opisani postupak može, po želji, dati i ciklične grafove, na primer:

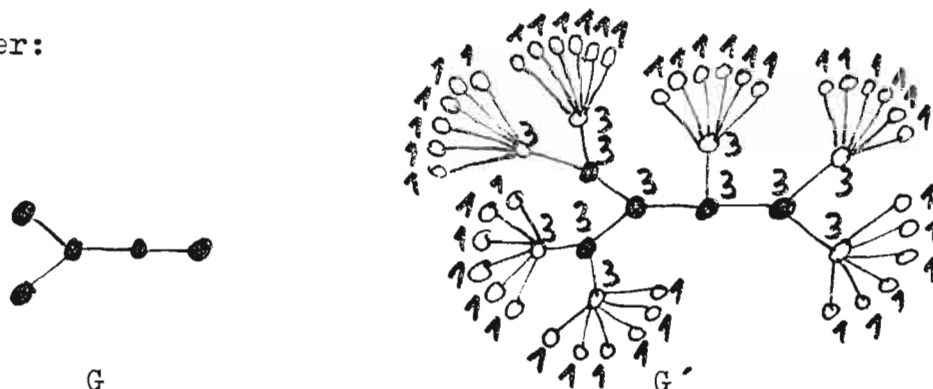


Našao sam i drugi način da se dobije neograničeno mnogo klasa grafova tražene osobine. Promatrajmo graf  $G$  čiji maksimalni stepen čvora ne prelazi 3. "Dopunimo" čvorove toga

grafa sa granom 

tako što dodamo jednu takvu

granu svakom čvoru stepena dva i dve grane svakom čvoru stepena jedan. Primer:



Maksimalni element spektra grafa  $G'$  je 3. Na ovako dobijene grafove  $G'$  mogu se još primeniti "transformacije za proširivanje" a - d.

Da li to nešto vredi?

Pozdrav

*Y. Ivan*

p.s. Čini mi se da je slučaj sličan kao i sa regularnim grafovima stepena 2 i stepena 3.

Sada, kada sam naučio konstruirati ovakve grafove vidim kako je put Smitha do njegove teoreme bio vrlo-vrlo jednostavan.

# »RUĐER BOŠKOVIĆ« INSTITUTE

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Dr. Dragoš Cvetković  
Elektrotehnički fakultet  
Sveučilište u Beogradu  
P.O.B. 816  
11001 Beograd

3. lipnja 1974.

Dragi Dragoš,

Evo poslije duljeg vremena Ti se javljam. Vjerojatno si čuo od Ivana da sam u Oxfordu imao prilike razgovarati nekoliko puta sa Professorom Hararyjem, pa se vrlo veselim mogućnosti ponovnog susreta s njime. U Oxfordu me je između ostalog zanimao i problem strukture grafova koji imaju cjelobrojne spektre. O tome sam po povratku razgovarao s Ivanom i on mi je rekao da ima već neke svoje rezultate, a da i Tebe interesira taj problem. Zato smo mi napisali jedan vrlo grubi draft članka o konjugiranim molekulama koje imaju cjelobrojne Hückelove energetske nivoe, što je ekvivalentno cjelobrojnom spektru. Pismu prilažem rukopis. Mi bi Te molili da ga pregledaš i ocijeniš. Naše je pak vjerovanje da ovaj člančić može u "Chemical Physics Letters" gdje smo već nas trojica objavili nekoliko članaka zajednički. Ideja je u tome da ništa tako sličnog nije kazano u kemijskoj literaturi, pa bi ovo bio prilog diskusiji o naročitim svojstvima molekula čiji su grafovi



S znatiželjom očekujem Tvoje mišljenje.

Srdačno Te pozdravljam,

*Nenad*

12.7.1974

Dear Professor Sachs,

Please find enclosed herewith the material on coefficient theorem, as we agreed in Belgrade. Other materials will be sent to you regularly, as I prepare them.

Mr. Doob wrote a letter to me apologizing for the delay. The manuscript is ready and soon it will arrive. I am enclosing the contents of Doob's manuscript. For the time being I am prevented from further work awaiting the manuscript.

Unfortunately, your visit was short and there was so much to do. I hope that other opportunities will arise to visit us without any work. Entire family of mine is impressed by you.

Please convey to your wife the warmest regards from my wife and myself,

Yours sincerely

D.Cvetković



PROF. DR. HORST SACHS

63 ILMENAU  
AM WENZELSBERG 12  
TELEFON 3317

Ilmenau, 13. 7. 74

Liebe Frau Cvetkovic',  
lieber Herr Cvetkovic'  
und Mladen !

Endlich, zum Wochenende, finde ich Zeit, Ihnen zu schreiben ! Zunächst möchte ich mich noch einmal recht, recht herzlich bedanken für die große Gastfreundschaft, die ich bei Ihnen genießen durfte, für alles, was Sie getan haben, um meinem Aufenthalt in Jugoslawien so schön zu machen : Für den Ausflug auf den Avala und nach Vršac und all die anderen Dinge. Ja, es war wirklich schön in Beograd, und ich werde noch lange daran zurückdenken. Und ganz besonderen Dank für die schönen Geschenke ! Auch meine Frau hat sich schrecklich gefreut - sie wird Ihnen noch selber schreiben.

Liebe Familie Cvetkovic', der Flug von Beograd nach Berlin war sehr angenehm. In Ljubljana gab es eine Zwischenlandung : Herrlich, der Flug über die Alpen ! Zuerst war sogar gute Sicht, aber je näher wir der Heimat kamen, desto höher türmten sich die Wolken. In Berlin war es ausgesprochen kalt, und die Menschen sahen so weiß aus : Auch von den Kollegen werde ich beneidet, weil ich so schön braun gebrannt bin. Hier ist es viel zu kalt, 11°C bis 16°C, und das im Hochsommer ! Erst heute wurde es etwas wärmer, obwohl die Sonne nicht

scheint: Das Thermometer stieg auf etwa  $19^{\circ}\text{C}$ .  
Für die Arbeit war das gar nicht so schlecht, denn  
ich habe sehr viele Prüfungen hinter mir, und  
da hat man es lieber zu kalt als zu warm. Morgen  
und übermorgen fahre ich nach Berlin, werde  
bei der Gelegenheit auch den Verlag aufsuchen -  
und dann wird weitergeprüft. Am Montag (übermorgen)  
ist in Berlin die Abschlussveranstaltung der internationalen  
Mathematik-Olympiade, an der ja auch eine jugo-  
slawische Mannschaft teilnimmt - wenn werden wir  
gratulieren dürfen?

Bitte, übermitteln Sie meinen Dank und meine  
besten Grüße an Ihre lieben Angehörigen in Bpmay -  
leider weiß ich weder Namen noch Adresse.

Venn ich beim Verlag war, lasse ich wieder von  
mir hören. Herr Runge hat die Arbeit aufge-  
nommen.

Herzliche Grüße!

Ihr Horst Sachs

Liebe Frau Cvětković!

Recht herzlich möchte ich Ihnen danken für  
die wunderschöne Tasche und die zarten Taschen-  
tücher mit Stickerei aus Volkskunstmotiven.

Das Täschchen passt sehr gut zu meinem Abend-  
kleid. Bitte, sagen Sie auch Ihrer lieben  
Frau Schwester mein herzliches Dankeschön  
für die hübsche Flandee (wie ziert meine Regal)  
und die gute Seife. Sie haben Dich sehr viel  
Mühe gemacht und meinem Mann einen sehr  
angenehmen Aufenthalt in Ihrer Heimat bereitet,

auch dafür danke ich Ihnen und Ihrem Herrn  
auch sehr. Mit den herzlichsten Grüßen Ihre  
Barbara Saacke

Visoko, 15 XII 1974

Dragi Dragoš<sup>ć</sup>

Hvala na pismu od 4. XII i na kopiji rada Hoffmana. Ako sam dobro shvatio, naš rad "On spectral structure ..." je prihvaćen. Na žalost neću moći da pristupim saopštenju rada u Matematičkom institutu, jer do pet meseci vojnici nemaju prava na odsustva iz takvih razloga.

Da Ti odgovorim i na ostala pitanja:

1 - Nisam obavestien da li su i meni dali određeni broj separata iz Croakice. No, u svakom slučaju ostaće Ti dovoljno izza slučaj da će meni trebati oko 15 separata. To ću javiti kasnije.

— Naš rad u J. Chem. Phys. je zaista izašao. Separate, zbog poznate finansijske situacije Instituta "R.B." nećemo dobiti. Ali mi planiramo da rad kopiramo u ofset tehnici i umnožimo u Institutu. Tada ćemo Ti poslati dovoljan broj kopija i moći ćeš da udovoljiš svim zahtevima. Inače, mislim da ne vredi da trošiš Troje zalike papira za fotokopije.

No kada će to konkretno biti - ne znam. Možda tek po mom povratku iz JNA.

— Isto važi i za naš rad u Chem. Phys. Letters. Koliko mi je poznato taj časopis se ne kupuje u Beogradu. U svom prvom ~~u~~ sledećem pismu zamolice Trina da Ti pošalje kopiju rada. (Inače, Trina je u SR Nemačkoj.)

— Prihvacen je i naš rad "On the number of NBMO's ..." u časopisu Journal of Molecular Structure (J. Mol. Struct.). Dakle dobra senja se nastavlja.

— Moj rad, koji je recenzirao prof. Saels je dobio i drugu pozitivnu recenziju i nalazi se u štampi. Izaci će uskoro. Pokazalo se da je to dobro jer sam dobio jedan zasada nedjavljeni rukopis u kojemu su duplirani neki rezultati iz tog mog rada, tačnije neki moji zaključci (pa čak i primeri) o egzistenciji Kekuléovih struktura. Međutim, nužni i dovoljni uslov(i) za egzistenciju  $\Lambda$  faktora u toj klasi grafova mi dalje nisu poznati.

— Ono što si pisao o rezultatima dr. Z. Stojiljkovića i Tebe golica maštu. Želim vam što više uspeha.

Ja se u slobodno vreme i dalje po-  
malo bavim grafomama ali su rezultati  
nišavi. No, možda će biti bolje kada  
prođe prvih 5 meseci.

molim Te da me i dalje, povremeno,  
obaveštavaš ako se dogodi nešto novo  
ili ako se pojavi neki rad koji bi  
mogao biti zanimljiv. A možda će doći  
vreme da Ti se i ja javim s nekakvim  
novim rezultatom.

Srdacni pozdravi

Ivan

Adresa: ← PAZI, adresa se (nekadaš) )

IVAN GUTMAN <sup>promenila</sup>  
71300 VISOKO  
V.P. 6472/5

Zagreb 17. VII 1974.

Dragi Dragoš.

Šaljem Ti original i dve kopije naša dva  
Lanka. Na žalost aparat za kopiranje se bio  
pokvario a ovakve kopije daje posle popravke (!).  
Nadam se da će kopije biti ipak upotrebive. Slike  
koje se na kopijama ne vide dobro trebaće se pojačati.

Molim Te javi da li je u redu, te kamo će  
radovi biti poslani.

Pozdrav

Jvan

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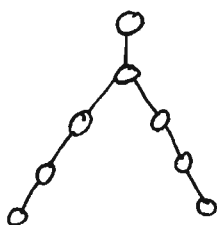
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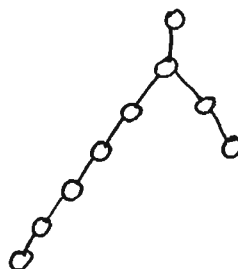
Zagreb, 24.7.1974.

Dragi Dragoš.

Posle pažljivog proveravanja našeg rada našao sam greške i ispravio ih. Pored toga, sklon sam da verujem da su sve ostale formule tačne. Da bi bilo sve ispravno, treba grafove  $T_5$  i  $T_6$  "skratiti za glavu", tj. oni treba da su:



$T_5$



$T_6$

Jednadžba (2f) glasi:

$$(2f) \quad T_3 + P_{14} + P_9 + P_5 = P_{29} + P_4 + P_2 + P_1$$

i shodno tome u jednadžbi (9f) treba staviti:

$$h_4 = t_3 + t_6.$$

Pošto se radi o minimalnim izmenama, nisam prekucao odgovarajuće stranice.

Molio bih Te da me obavestiš o sudbini naših radova, kada to bude moguće. Rad o nulama u spektru je kod daktilografkinje i sigurno će biti gotov pre našeg odlaska na godišnji odmor.

Srdačni pozdravi

*Ivan*



»RUĐER BOŠKOVIĆ« INSTITUTE

41001 Zagreb, Croatia, Yugoslavia

POB 1016  
PHONE: (041) 424-355  
TELEX: 21-383

Zagreb 26. VII 1974.

Dragi Dragos

Izvrstno mi je neugodno zbog dodatnih grešaka koje si našao. Stvarno sam detaljno prekontrolisao rad, a (nažalost) narocito relacije (2). Ali, eto, čovek je ponekad slep.

Danas se Institut raspusta; ja za dva-tri sata putujem u Sombor.

Pozdravi

Joan

Inače, ovo me potseća na jednu anegdotu iz <sup>~</sup>XVIII veka

Neki čuveni stampar otstampao je Bibliju vodeći narocitu pažnju da se ne potkrade niti jedna stamparska greška. Kada je bio siguran u savršenost svog dela izložio je primerak knjige u gradskoj većnici i ponudio veliku nagradu onome ko nađe makar

pronašli čitav niz grešaka, a jesmo čak i u  
naslovu knjige.

Navodno je priča istinita a dogodila se,  
ako me sećanje ne vara, u Nemačkoj.

Jumenau, 29. 7. 74

Liebe Frau Cvetkovic,  
lieber Herr Cvetkovic!

Seit 3 Wochen bin ich wieder in Jumenau,  
und ich muß oft an Beograd denken:  
Ich möchte Ihnen beiden noch einmal  
herzlich danken, daß Sie mir den Aufenthalt  
dort so angenehm gemacht haben!

Hier erwartete mich viel Arbeit, so daß ich nun  
Verständnis bitte, wenn ich so selten schreibe:  
Inzwischen habe ich die Hauptmenge der  
Prüfungen hinter mir, nur noch morgen  
und übermorgen, vom 1. August an  
herrscht dann etwas Ruhe.

Lieber Herr Cvetkovic, ich habe mich für  
zwei Sendungen von Ihnen zu bedanken:  
Erstens für die Bücher, die hier gut  
angekommen sind (noch einmal für  
die Übersetzung meines Artikels vielen Dank!),  
und zweitens für Ihre Sendung vom 12. 7.  
mit den Angaben über den "Koeffizienten-  
satz". Hier wandte sich vor wenigen  
Tagen ein Chemiker aus Berlin (Dr.  
Wolfgang Schäfer) an mich, der einige  
Fragen beantwortet haben wollte: Er  
bekam andere Verzeichen für die

Er hat sich auch die Adresse von Herrn Doob notiert: Offenbar ist der Verlag sehr daran interessiert, mit Herrn Doob direkt einen Vertrag zu schließen, dann kann er auch ohne weiteres in § zahlen und wir haben damit keine Schwierigkeiten. Ist das Manuskript von Herrn Doob schon eingegangen? Herr Arnold braucht natürlich eine Information über Wert und Umfang des Manuskripts. Wie gesagt, Herr Arnold wollte sich mit Ihnen direkt brieflich in Verbindung setzen und Ihnen einen Vertragstext (oder Entwurf) vorschlagen - bitte, schreiben Sie mir, ob das geschehen ist, und was ich gegebenenfalls unternehmen soll.

In einem Punkt ist mir auch ein kleiner Fortschritt gelungen: Ich konnte nämlich Ihr Problem lösen, und zwar durch Konstruktion unendlich vieler natürlicher Zahlen-Sextupel  $(x, y, z; x', y', z')$ , die den Bedingungen

$$(*) \quad \left\{ \begin{array}{l} xyz = x'y'z' \\ xy + yz + zx = x'y' + y'z' + z'x' \\ x + y + z \neq x' + y' + z' \end{array} \right.$$

genügen:

Koeffizienten heraus, da er offenbar das Polynom nach Heilbrunner / Spialter in der Form  $|x \cdot E + A|$  berechnet hatte. Nun bin ich in der Lage, Ihnen genügend viele Literaturhinweise zu geben.

Vor etwa 2 Wochen habe ich in Berlin mit Herrn Arnold vom DVW gesprochen; er wollte Ihnen selbst schreiben, vielleicht hat er das schon getan? Ihre Vorstellungen und Wünsche zum Vortrag hat er zur Kenntnis genommen und notiert (die erste Rate wird bestimmt nicht mehr in diesem Jahr gezahlt), er muß sich erst selbst erkundigen, wie es mit der Zahlung in clearing-dollars steht. Normalerweise zahlt der Verlag in der Währung des ~~Autors~~ Landes, in dem der Autor zu Hause ist, die Frage, ob Sie einen Anteil in Mark der DDR haben möchten, ist für den Verlag ohne tiefere Bedeutung. Wenn der Vertrag mit AP zustande kommt, besteht natürlich die Möglichkeit, über AP in  $\$$  zu zahlen, aber AP hatte sich noch nicht wieder geäußert. Spätestens zur Buchmesse im Herbst will Herr Arnold mit dem Vertreter ~~in~~ von AP zusammen treffen.

Man setze

$$x = y = [\rho(\rho+\sigma)\tau + 1][\sigma(\rho+\sigma)\tau + 1]$$

$$z = \rho\sigma\tau + 1$$

$$x' = [\rho(\rho+\sigma)\tau + 1][\sigma(\rho+\sigma)\tau + 1](\rho\sigma\tau + 1)$$

$$y' = \rho(\rho+\sigma)\tau + 1$$

$$z' = \sigma(\rho+\sigma)\tau + 1$$

Dann gilt identisch (identisch in  $\rho, \sigma, \tau$ ):

$$xyz = x'y'z' \quad , \quad \odot$$

und man kann leicht nachrechnen,  
daß auch

$$xy + yz + zx = x'y' + y'z' + z'x'$$

(identisch in  $\rho, \sigma, \tau$ ) erfüllt ist.

Setzt man für  $\rho, \sigma, \tau$  natürliche Zahlen ein, so sind auch  $x, y, z; x', y', z'$  natürliche Zahlen, und die beiden Tripel sind von einander verschieden, weil offenbar  $z$  kleiner ist als jede der drei Zahlen  $x', y', z'$ .  
Damit erhält man beliebig viele Lösungen von (\*). - Der einfachste Fall ist

$$\rho = \sigma = \tau = 1 \quad \text{und führt zu}$$

$$x = y = 9, \quad z = 2, \quad x' = 18, \quad y' = z' = 3$$

Mit  $\rho = \tau = 1, \sigma = 2$  erhält man

$$x = y = 28, \quad z = 3, \quad x' = 84, \quad y' = 4, \quad z' = 7,$$

n. v. w.

Mit herzlichen Grüßen!

Ihre

Barbara und Horst Sachs

Beste Grüße  
dem Herrn  
Stamm



108 BERLIN, JOHANNES-DIECKMANN-STRASSE 10  
Postfach 1216

Herrn

Dr. D. Cvetković

11 000 B e o g r a d

Lamartinova 44

Jugoslawien

Ihr Zeichen

Ihre Nachricht vom

Unser Zeichen/Hausruf

Tag

At/Tu 209

16. August 1974

Betrifft

Spectra of Graphs

Sehr geehrter Herr Dr. Cvetković!

Wir beziehen uns auf ein Gespräch mit Herrn Prof. Sachs in unserem Verlag, in dessen Verlauf er uns über die Ergebnisse Ihrer gemeinsamen Beratungen im Juli informierte.

Wie eine Rücksprache mit unserem Büro für Urheberrechte, von dem alle Verträge mit ausländischen Autoren registriert werden, ergab, ist es uns bedauerlicherweise nicht möglich, Ihnen Ihren Anteil am Honorar in einer anderen Währung als Ihrer Landeswährung Dinar zu zahlen. Auch eine Zahlung in Clearing-Dollars ist nicht möglich. Sollten Sie den Wunsch haben, einen Teil Ihres Honorars zum Verbrauch in der DDR zu belassen, so würden wir einen entsprechenden Passus in den Vertrag aufnehmen. Eine Notwendigkeit dazu, etwa im Interesse einer guten Zusammenarbeit, besteht jedoch nicht, sondern wir sind gern bereit, Ihren gesamten Honoraranteil (in Dinar) zu transferieren, und wären Ihnen für die gelegentliche Nennung Ihrer Bankverbindung sehr dankbar. Der Zahlung des Honorars an Herrn Dr. Doob in Dollar steht jedoch nichts im Wege. Um diesen Anspruch zu sichern, sind wir mit Herrn Prof. Sachs übereingekommen, Herrn Dr. Doob mit in den Autorenvertrag aufzunehmen.

Telefon: 22900

Telegrammanschrift: Devauwe Berlin    Konto: Berliner Stadtkonto der HfB. 108 Berlin, Behrenstraße 35-39, Konto-Nr. 6651-16-627  
PSchA Berlin, Konto-Nr. 21827

BN 90130937


Blatt 2 zum Schreiben vom 15. 8. 74 an Herrn Dr. D. Cvetković

Leider hat sich Academic Press bisher noch nicht zu dem übersandten Probekapitel geäußert. Im Interesse seiner Mitautoren haben wir daher Herrn Prof. Sachs gebeten, möglichst umgehend weitere Kapitel zur Verfügung zu stellen, um diesem Verlag die Entscheidung zu erleichtern. Im Fall der Übernahme einer Lizenzauflage durch diesen (oder auch einen anderen) Verlag wäre es uns jedoch möglich, die Autoren mit einem gewissen Prozentsatz ihres Honorars an dem Erlös in Dollar zu beteiligen. Dieser Prozentsatz wird jedoch im Höchstfall 35 % des Gesamthonorars betragen.

Herrn Prof. Sachs werden wir mit gleicher Post informieren und uns auch in Kürze mit Herrn Dr. Doob in Verbindung setzen.

Mit vorzüglicher Hochachtung  
und freundlichen Grüßen

VEB DEUTSCHER VERLAG DER WISSENSCHAFTEN

  
Dr. Walter  
Verlagsleiter

  
Arndt  
Lektoratsleiterin



# VEB DEUTSCHER VERLAG DER WISSENSCHAFTEN



108 BERLIN, JOHANNES-DIECKMANN-STRASSE 10  
Postfach 1216

Herrn  
Dr. Michael Doob  
Assistent Professor  
The University of Manitoba  
Department of Mathematics and Astronomy  
W i n n i p e g , Canada  
R 3 T 2N 2

Ihr Zeichen

Ihre Nachricht vom

Unser Zeichen, Hausruf  
At/Tu 209

Tag  
16. August 1974

Betrifft

Spectra of Graphs

Sehr geehrter Herr Dr. Doob!

Im Anschluß an seine Beratungen mit Herrn Dr. Cvetković im Juli in Belgrad informierte uns Herr Prof. Sachs auch über Ihren Anteil an der von den beiden Autoren geplanten o. g. Veröffentlichung. Zur Sicherung Ihrer Autorenrechte sind wir daher über-  
eingekommen, Sie auf dem Haupttitel zu nennen, etwa in folgender Form:

"Mit einem Beitrag von M. Doob"

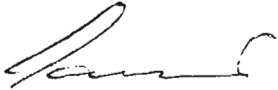
und als Mitautor in den noch abzuschließenden Vertrag aufzunehmen.

Die Zahlung Ihres Honoraranteils am Gesamtwerk erfolgt über unser Büro für Urheberrechte, von dem alle Verträge mit ausländischen Autoren registriert werden und das die Transferierung in Dollar vornimmt. Wir wären Ihnen daher sehr dankbar, wenn Sie uns Ihre Privatanschrift sowie Ihre Bankverbindung nennen würden, damit die Zahlung zu gegebener Zeit reibungslos erfolgen kann.

In der Hoffnung auf eine gute Zusammenarbeit verbleiben wir

mit vorzüglicher Hochachtung  
und freundlichen Grüßen

VEB DEUTSCHER VERLAG DER WISSENSCHAFTEN

  
Dr. Walter  
Verlagsleiter

  
Arndt  
Lektoratsleiterin

Telefon: 22900

Telegrammschrift: Devauwe Berlin · Konto: Berliner Stadtkontor der HfB, 108 Berlin, Behrenstraße 35-39, Konto-Nr. 6651-16-627  
PSchA Berlin, Konto-Nr. 21827

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WISSENSCHAFTEN



Herrn  
Dr. D. Cvetković

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41001 Zagreb, Croatia, Yugoslavia

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PHONE: (041) 424-355  
TELEX: 21-383

Dr. Dragoš Cvetković  
Lamartinova 44  
11000 Beograd

29. kolovoza 1974.

Dragi Dragoš,

Pišem Ti u vezi našega zajedničkoga rada "Conjugated Molecules Having Integral Graph Spectra", koji je prihvaćen za tisak u časopisu za kemijsku fiziku "Chemical Physics Letters". Mi ni smo u stanju kupiti posebne otiske ovoga rada, jer je Institut u vrlo teškom materijalnom položaju. Zato bih Te zamolio (ako je to moguće?) da Tvoj fakultet naruči otiske ovoga rada. Pismu stoga prilažem narudžbenicu. Ako je to nemoguće onda ispuni taj Reprint Order bez narudžbe reprinata i pošalji ga na označenu adresu.

U posebnoj koverti Ti šaljem 10 posebnih otisaka našega rada "Graph Theory and Molecular Orbitals. IX. On the Stability of Cata-Condensed Hydrocarbons", koji je izašao u "Theoretica Chimica Acta".

Srdačni pozdravi,

*Nemad*

*Dragi Dragoš*

*Ideu u JNA 12. IX. Sada dovršavam zere što je započeto, ali sam već "izbačen iz stroja". Javiti Ti se neposredno prije odlaska.*

*Pozdrav*

*Jovan*

Jlumenau, 31. 8. 74.

Liebe Frau Cvettkovic,  
lieber Herr Cvettkovic!

Recht herzlichen Dank für Ihre Karte aus Poreč; ich hoffe sehr, daß Sie alle drei recht schöne Urlaubstage an der blauen Adria verbracht haben! Hier war das Wetter miserabel: Von einer einzigen Woche abgesehen kalt wie im Herbst, so daß wir die ganze Zeit heizen mußten. Und nun geht der "Sommer" schon wieder zu Ende... Jlumenau hat übrigens eine schöne Badeanstalt bekommen, im Tal nach Manebach gelegen, grüne Berge als Kulisse - aber was nützt die schönste Badeanstalt, wenn es kalt ist oder regnet... Meine Pläne haben sich leider gar nicht so gut entwickelt, wie ich mir das gewünscht hatte: Ich konnte erst am 15. August in Urlaub gehen, und vorgestern, am 29. August, hat bereits das neue Semester begonnen. Eine Woche Urlaub mußte ich auch meinem alten Vater widmen, so daß nicht viel Zeit übrig blieb.

Bei der Beschäftigung mit dem Manuskript

bin ich auf folgendes gestoßen (im Zusammenhang mit einer Korrespondenz mit einem hiesigen Chemiker, ich berichtete Ihnen schon darüber in meinem letzten Brief): In dem "Appendix", Tafel 5 (5.1 bis 5.4) ergeben sich Abweichungen in den Vorzeichen der Koeffizienten, und zwar scheint es so, daß in dieser Tafel nicht  $|\lambda E - A|$ , sondern  $|\lambda E + A|$  berechnet wurde. Sie schreiben, daß diese Tabellen aus [5] (E. Heilbronner, Das Kompositionsprinzip ..., Helv. Chim. Acta 36 (1953), 170 - 188) entnommen seien. Könnten Sie bitte mal überprüfen, wie sich das verhält? Leider habe ich diese Arbeit von Heilbronner nicht hier.

Haben Sie inzwischen von Alan J. Hoffman eine Antwort bekommen? Ich leider nicht. Herr Lovász hat mir den Durchschlag einer Arbeit geschickt: "Spectra of graphs with transitive groups", doch leider ohne jeden Brief oder Kommentar - ich weiß nicht, ob das die Antwort auf unseren Brief ist. Sein Resultat lautet wie folgt:

" Let  $\Gamma$  be a transitive group of auto-morphisms of  $G$ ,  $\chi_1, \chi_2, \dots, \chi_t$  be the characters of  $\Gamma$ ,  $n_1, n_2, \dots, n_t$  be the dimensions of the corresponding irreducible representations. Let, for each  $\gamma \in \Gamma$ ,  $p_\gamma$  be the number of points  $x$  of  $G$  mapped onto a point adjacent to  $x$ .

...  
We get the following rule to calculate the eigenvalues of  $G$ :

Write down the value

$$\frac{1}{|\Gamma|} \sum_{\gamma \in \Gamma} p_\gamma \chi_i(\gamma)$$

$n_i$  times for  $i=1, 2, \dots, t$ . Remove  $(s-1)n$  zeros from this sequence. The remaining numbers are the eigenvalues of  $G$ . " ( es ist  $s = \frac{|\Gamma|}{n}$  )

Wie steht es mit dem Beitrag von Herrn Doob?

Recht herzliche Grüsse, auch an Herrn Simić und seine Angehörigen,  
Ihre Barbara und Horst Sachs

Gerade erfahren ich von dem schrecklichen Ereignissen in Zagreb.

3.9.1974

VEB Deutscher Verlag  
der Wissenschaften  
108 Berlin,  
Johannes-Dieckmann-Strasse 10  
Postfach 1216

Dear Sirs,

Thank you very much for your letter of 16.8.1974.

I agree with your proposal to pay out a part of my author's fees in the way you usually do it. Please keep 10% of my fees so that I can have it at my disposal in GDR.

My bank account is:

JUGOBANKA, 7 Juli 19-21, 11000 Beograd, Yugoslavia

No. 3221/120-12-01-14778-6

I wish to inform you that I completed the work on the part of the book which I am writing (including the part made by Dr. Doob). If the fact that the Academic Press did not declare the final decision is not a hindrance, I would like you to prepare an Agreement concerning the book. May be you could insert into the Agreement a conditional clause guaranteeing a part of the fees in hard currency, provided the cooperation with Academic Press realizes.

Yours sincerely

D. Cvetković

TECHNOLOGICAL UNIVERSITY EINDHOVEN - Department of Mathematics

PO BOX 513 - EINDHOVEN  
THE NETHERLANDS

Prof. D. Cvetković  
Department of Mathematics  
Faculty of Electrical Engineering  
University of Beograd  
P.O. Box 816  
11.001 BEOGRAD  
Yugoslavia.

EINDHOVEN,  
September 17, 1974

Dear Dr. Cvetković,

Having been away for half a year I found upon my return home your letter dated June 1974. As my secretary wrote you, I was difficult to reach during the last months. So finally, here are answers to your questions.

I was sorry to hear abroad that Professor Sachs has been ill. I indeed heard of your writing a book on graph spectra (for instance from Michael Doob). Of course you may take, with usual reference to the source, the tables from the "elliptic" paper. Amusingly, Doob asked me the same question with respect to a yet unpublished paper, of which I shall send you a copy.

I spent 3 months working with A.J. Hoffman this spring, and indeed we are planning a book on "Graphs and their spectra". However, I believe that there is ample room for two books. Probably, our emphases will be quite different. Just look at our work. I shall answer your second question in a separate letter, for administrative reasons. Unofficially, I inform you that your idea to spend a year here appeals to me.

Sincerely,



J.J. Seidel.



TECHNOLOGICAL UNIVERSITY EINDHOVEN - Department of Mathematics

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THE NETHERLANDS

Prof. D. Cvetković  
Department of Mathematics  
Faculty of Electrical Engineering  
University of Beograd  
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11.001 BEOGRAD  
Yugoslavia.

EINDHOVEN,

September 17, 1974

Dear Dr. Cvetković,

From your letter dated June 10, 1974 I learned that you are interested in a research fellowship at our university. Having returned recently from a stay abroad, I discussed your interest within the Department of Mathematics (which has not been informed about your interest by the central authorities). At our department I met sympathy with respect to the idea of your possible application. As for myself, I share those feelings. We have several specialists in combinatorics and graph theory, such as N.G. de Bruijn, J.H. van Lint, C.J. Bouwkamp. In addition, in the departments of Electrical Engineering and Chemistry the interest in applications of graph theory is growing (unfortunately, we have a lack of people to maintain and develop these contacts).

We would appreciate to have more details about you. Therefore, I ask you to send me a curriculum vitae, with details about age, studies, family, carrier, list of publications, references, etc., along the lines of the enclosed pamphlet. I am willing to pass this information on to the officials of the department.

I am rather pessimistic about the possibility for you to entertain your wife and son solely from the fellowship. This depends of course on your style of living and position at home. I derive this pessimism from experiences with other foreign mathematicians. For example, the University provided housing for a mathematician, his wife, his 2 children, for 850 Dutch florins per month, which is almost half of the amount of 1800 Dutch florins provided by the fellowship. Please inform me about the possibilities of a partial support by your own country and (or) university.

On the other hand, similar experience gives me the possibility to assure you that our University and our Department is well equipped to receive foreign families. In addition, please interpret the pessimism expressed above as realism. We could consider the whole question on the basis of the information which I ask you to send me.

I await your further notice in due course, since the decision about the fellowships is to be taken at the end of 1974.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Seidel".

J.J. Seidel.

»RUĐER BOŠKOVIĆ« INSTITUTE

41001 Zagreb, Croatia, Yugoslavia

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PHONE: (041) 424-355  
TELEX: 21-383

31. rujna 1974.

Dragi Dragoš,

Hvala Ti na pismu od 27. rujna. Ivan se jasio kantonu iz vojske i za sada mu nije loše. Što se tiče Nižemste, ja znam jedino de Bruijna iz Amsterdama da se bavi primjenom Fourier grafova u kemiji.

To je dobra vijest da je knjiga o spektrima grafova skoro gotova. Ne-  
Antim, od liste referenci iz Tvojega  
pisma jedino je dosada istražio rad:  
I.G. + N.T., Violation of the Dewar-dougnet-  
Higgens conjecture u Z. NATURFORSCHUNG  
29a, 1238 (1974), čiji Ti posebni otisak  
prilašam pismu. Kada se bilo koji  
nisi rad iz Fourier grafova pojavio,  
ja ću Ti odmah poslati otiske.  
Sadašnji poslovi;

Nezad

P.S.  
Upravo su stigli otisci za I. gutmanova rad,  
- T. redar Sakoder prilašam pismu.

»RUĐER BOŠKOVIĆ« INSTITUTE

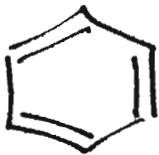
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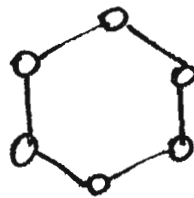
1. listopada 1974.

Dragi Drago,

Imam molbu na Tebe. Da li bi mogao pregledati našu kratku notu o Möbiusovim molekulama i grafovima, Notu prilaženju prilaženju. Tu smo dosada uvijek radili sa takozvanim Hückelovim molekulama i grafovima:



Hückelov benzen



Hückel graf

Medutim, ima jedna klasa konjugiranih molekula, koju mi nazivamo Möbiusove (ili anti-Hückelove) molekule, kod kojih jedna veza nema uobičajeni naskok u  $\Delta + 1$  nego  $-1$ , jer reflektira tzv. negativni overlap između dvoje  $2p_z$ -orbitale. Budući da smo pri tome modificirali Sachsovu formulu intereso me Tvoje mišljenje.

Ja imam krajem mjeseca pentuzem na 4 mjeseca u Düsseldorf.

Srdnači pozdravi, Nenad

Jlmenau, 14.10.74

Lieber Herr Cvetković!

Es wird höchste Zeit, daß ich Ihnen schreibe und Ihnen für Ihre vielen Briefe, die ich inzwischen erhalten habe, recht herzlich danke! Vor allem danke ich Ihnen, daß Sie immer bestrebt sind, mir noch weiter bei der Arbeit zu helfen. Ich glaube, daß ich alle Ihre Briefe erhalten habe (die Post geht manchmal sehr lange): Einen Brief vom 25.7.74 mit Manuskript "The reconstruction problem..." von I. Gutman und Ihnen sowie "Some ideas", "Problems" und "Gedanken über die Spektren"; eine Sendung vom 27.8.74 mit dem 55-Seiten-Manuskript von Doob, 5 Seiten Referenzen, 20 Seiten Skizzen, 12 Seiten "Miscellaneous...", 2 Seiten "Theorem ([A71])" sowie das Manuskript "On spectral structure..." von Ihnen und I. Gutman; eine Sendung vom 3.9.74 mit "3.4. Eigenvectors" (6, Seiten), Referenzen (insgesamt 9 Seiten), "Über Literaturverzeichnis" (6 Seiten), "Graphs, Groups and Matrices" von Abbe Mowshowitz; einen Brief vom 20.9.74 mit zwei Exemplaren "Inequalities obtained..." ;

einen Brief vom 30.9.74 mit weiteren Referenzen und "Table of contents" - das wäre wohl alles (ich hoffe sehr, dass nichts verloren gegangen ist?).

Lieber Herr Cvetković, mir ist schon klar, dass ich die restliche Arbeit nun allein machen muss, und ich werde mir große Mühe geben.

Vor allem freue ich mich, dass Seidel Ihnen geantwortet hat und dass Sie mit ihm zusammenarbeiten werden. Sicherlich wird Ihnen das viele neue Einsichten bringen, jetzt von einer ganz anderen Warte aus, und das wird Ihnen gewiss zu einem viel tieferen Verständnis der Spektraltheorie verhelfen - vielleicht werden Sie zentrale Zusammenhänge erkennen, die weder Seidel noch wir von unseren gegenwärtigen Standpunkten aus sehen können. Ich habe immer das deutliche Gefühl, dass hinter dem Begriff des Spektrums, den wir vorerst nur ganz vordergründig erfassen, noch etwas anderes, Wesentliches verborgen ist, sozusagen der "Schlüssel zum Verständnis der Zusammenhänge zwischen Kombinatorik und Algebra" (vielleicht sollte man das

einfacher ausdrücken, aber mir fallen keine  
besseren Worte ein). Jedenfalls bitte ich Sie,  
mit mir auch weiterhin Kontakt zu halten;  
wenn Sie von Seidel zurückkommen, wird  
meiner Buch vermutlich schon längst  
„veraltet“ sein: Dann müssen Sie ein  
neues schreiben!

Lieber Herr Cvetković, ich wollte diesen Brief  
eigentlich erst abschicken, wenn das erste  
Kapitel völlig fertig ist, aber da gibt es noch  
immer Verzögerungen, so daß ich nicht länger  
warten will und Ihnen beiliegend wenigstens  
den Teil, der schon in Reinschrift vorliegt,  
zusende: Sie sollen sehen, daß es doch voran  
geht, wenn auch - leider - sehr langsam.  
Ich habe jetzt 3 Tage Urlaub genommen,  
um wieder ein Stück voranzukommen. Sie  
wissen, wir feierten am 7. Oktober den 25. Jahrestag  
der Gründung der Republik, und ich bin  
der Herausgeber des Festbandes „Entwicklung  
der Mathematik in der DDR“ (756 Seiten),  
und da hatte ich noch alle Hände voll  
zu tun, um zu erreichen, daß der Band  
pünktlich erscheint (wenn ich einige Exemplare  
bekomme, werde ich Ihnen eines schicken).

Von meinen Mitarbeitern kann ich nicht zu viel verlangen: Herr Walther ist für ein halbes Jahr in Moskau, zwei weitere sind krank, so daß sich die übrigen die Arbeit in der Lehre teilen müssen (ich lese jetzt für Ingenieur-Studenten).

Gegenwärtig haben wir <sup>für 4 Wochen</sup> einen sehr sympathischen Gast: Herrn Ernest Jucovič aus Košice (ČSSR).

Wir unterhalten uns viel über Polyedergraphen, die Theorie ist ebenso schwierig wie interessant. Herr Jucovič hat einige Ideen, die etwas versprechen und die er gern weiter verfolgen will. Allerdings, mit Spektren hat das gar nichts zu tun, und ich bin wohl schon zu alt, um mühelos von einem Gebiet in das andere wechseln zu können. (Natürlich kennen Sie Herrn Jucovič, Sie haben ihn im vorigen Jahr beim XVIII. Kolloquium in Ilmenau getroffen!). Übrigens findet hier gegenwärtig das XIX. Int. Wiss. Koll. statt, das zwar diesmal nicht unsere Sektion betrifft (ich brauche keinen Vortrag zu halten!), aber doch für die ganze Hochschule eine Mehrbelastung mit sich bringt.

Ich will in diesem Jahr - vielleicht im Dezember - für 2 Wochen nach Košice fahren, um



den Besuch von Herrn Jucovič zu erwidern (als Gastdozent). Aber das braucht die Arbeit nicht zu unterbrechen. Außerdem werde ich vom November ab monatlich für eine Woche an einem Spezialkursus teilnehmen.

Lieber Herr Cvetković, das wäre wohl das Wichtigste, das ich Ihnen mitzuteilen habe. Meine große Bitte ist stets die gleiche:

Haben Sie, bitte, Verständnis dafür, daß es nicht schneller vorangeht.

Bitte, übermitteln Sie unsere besten Grüße und Wünsche an alle, die ich bei Ihnen kennen lernte: Ihre liebe Frau, Boba, Ihren Sohn und Ihren Herrn Bruder sowie Herrn Simić und seine Angehörigen.

Ihre

Horst Sachs und Frau  
Barbara.

Anlage: Manuskript  
(insgesamt 25 Seiten)

P.S.: Ich habe mich entschlossen, den Abschnitt über „Allgemeine Sätze der Mannjunkturtheorie“ aus Kap. I herauszunehmen und schon in Einzelkapiteln (den man ... ) zu veröffentlichen.

18.10.1974

Dear Professor Seidel,

Thank you for your letters of 17.9.1974. The particularities concerning my possible coming ~~are~~ given in a separate letter. My part of the book "Spectra and graphs", which is written in cooperation with Prof. Sachs is completed. I expect that Prof. Sachs will finish his part until the end of the year. With reference to the book I am most kindly asking you to give me the list of your papers =and those of your associates= relative to spectra of graphs. I believe that I have the survey of your papers, but due to the omissions of some bibliographical data and possibilities that I have omitted some papers, I am most kindly asking you for that.

I am enclosing herewith my latest paper "The determinant concept defined by means of graph theory" in which you may be interested and which may be important in the tuition of mathematics. I shall try this year to teach ~~the~~ theory of determinants to students in this way.

Yours sincerely

Dragoš Cvetković

18.10.1974

Dear Professor Seidel,

Thank you for your letters of 17.9.1974, informing me on particularities regarding my request about research fellowship of your University. Only upon the receipt of your letter I have started more seriously to think to apply for the fellowship, and since it is not a simple decision, because I have got a family, I am replying to you only now, upon a month time.

I did not reach a decision yet, but it is very probable that I shall apply for fellowship. You will be informed about it until 1.12.74, at the latest, and probably even earlier.

I am enclosing herewith the curriculum vitae and a list of papers. Here are some data on papers:

1. is the collection of problems for secondary schools.
21. is the auxiliary text book for the students of our Faculty, entitled Graph theory and its application.
2. is approximately the same as 13.
4. is the paper about series
5. is a popular paper on graph theory.
- 9,25,31, combinatorics
- 6,27,29,32,34,35,36 graph theory without spectra
- 4,7,8,10,11,12,14,15,16,17,18,19,20,22,23,24,26,28,30,31,33,37,38,39,40 papers on spectra.
- 23,26,27,32,33,34,37,38, - applications in chemistry.

Apart from the foregoing, I have collaborated in the elaboration of several text books made by our Chair.

During my stay in the Netherlands, I would get a part of my salary from my Faculty, so that, together with the fellowship it may be sufficient for me and my family. May be my family would spend only a time in the Netherlands.

I would appreciate your answers to the following question

1. What would I be expected to do during my stay? Which would be my tasks? Would I be free to choose the concrete themes for the research work, naturally within the framework of the general agreed upon topic, with consultations with you and the members of your chair? Are the working hours fixed? From which date and un-

til when am I expected to be in the Netherlands, and could I make short stays in Belgrade during that period?

2. What is the kind of housing, you are speaking about in your letter. We would be satisfied with a two-room, or even with a single room, furnished, having a kitchen and the bathroom. Does the price of 850 Dutch florins per month include heating, electric lighting, laundry and so on? How much money needs a three-member family for decent alimentation, if the food is made by themselves?

I apologize for such detailed questions, but your answers to them would be of great help to me.

Yours sincerely

Dragoš Cvetković

NAUČNO-NASTAVNOM VEĆU ELEKTROTEHNIČKOG FAKULTETA - BEOGRAD

Molim veće da mi odobri da konkurišem za dobijanje stipendije za naučni rad koje daje University of Technology iz Eindhovena, Holandija. Moj interes za dobijanje ove stipendije se sastoji u tome što na katedri za matematiku ovog univerziteta radi više stručnjaka za kombinatoriku i teoriju grafova. Univerzitet je predvideo stipendije za razne naučne oblasti pa i za teoriju grafova.

U slučaju da dobijem stipendiju, podneću naknadno veću molbu za odobrenje plaćenog odsustva za školsku 1975/76 godinu.

Šef katedre za matematiku je saglasan sa mojim učešćem na konkursu.

Beograd 18.10.1974.

Dragoš Cvetković  
docent El.teh.fak.

Ilmenau, 20.10.74

Liebe Familie Cvetković!

Heute fand ich beiziehenden  
Artikel in der Zeitung, und da  
möchte ich die Gelegenheit nicht  
vorübergehen lassen, um Ihnen  
auch aus Ilmenau recht  
herzliche Glückwünsche zu Ihnen

Herr Biggs hat mir ein Exemplar  
"Abstrakte Graph Theory" geschickt.

30. Jahrestag zu übersenden!  
(Wir hatten am 7. 10. den 25.  
Jahrestag der Gründung der Republik) -

Ich habe den ganzen Tag an dem  
(enorm umfangreichen!) Literatur-  
verzeichnis gearbeitet: Das ist jetzt  
absolut vorrangig, weil ich sonst die  
Übersicht verliere.

Herzlich grüßen

Ihre  
Barbara und Horst Sachs

TECHNOLOGICAL UNIVERSITY EINDHOVEN - Department of Mathematics

PO BOX 513 - EINDHOVEN  
THE NETHERLANDS

Prof. D.M. Cvetković  
Dept. of Mathematics  
Faculty of Electrical Engineering  
University of Beograd  
P.O. Box 816  
11.001 BEOGRAD  
Yugoslavia.

EINDHOVEN,  
October 25, 1974

Dear Dr. Cvetković,

Having received your letter of 18-10-1974, I am rather optimistic about the possibility for a stay at our university. Indeed, your curriculum and list of publications would strongly support a possible application for the research fellowship. In addition, the boundary conditions seem to admit reasonable possibilities. Let me answer your questions in some detail.

We expect research fellows to do research, to participate in the corresponding activities of the department and, perhaps, to get an idea how university life in a foreign country compares to that of the home country. In particular, I would hope that you would work with me on problems of common interest, join the seminar led by Van Lint (in which combinatorialists of our department meet), hopefully have some contacts with De Bruijn, maybe try to penetrate a little in the departments of electrical and chemical engineering (in collaboration with Van Lint and myself) on applied problems of graph theory. Maybe you would be interested in the curriculum of mathematical engineering and in students who work in the area of combinatorics. Maybe you are interested and able to use computers in graph theory.

You would be considered as a mature mathematician, capable of choosing his own themes, and ready to be interested in the mathematics of his colleagues. We do have the philosophy that our research objects should meet ~~X~~ the presence of a technological university. But in your case I have no fear whatsoever that you would deviate into the direction of general abstract nonsense, or sterile mathematics.

Our working hours are 8.30 - 12.30 and 13.30 - 17.30, I believe. We have no time watch, and behave like grown up people. On the other hand, we do have a mathematical department, and not a place where individuals come to deliver their lectures and stay home otherwise. In principle, the vacations are about one to two months.

From your letter I now have an idea about your wishes concerning housing. These would enable you to keep your pure housing expenses well under the amount of 850 Dutch Florins, which I took as an example for an American family with 2 children, in a complete furnished house with 5 rooms + bath + kitchen, etc., including heating and light. These Americans tell me that a simple non-luxurious life is possible for the 1800 Dutch Florins, including the rent of the house, but excluding travels, entertainments, and the maintenance of a car. If you would possess a car, then perhaps you could bring it to Holland.



TECHNOLOGICAL UNIVERSITY EINDHOVEN - Department of Mathematics

PO BOX 513 - EINDHOVEN  
THE NETHERLANDS

Prof. D.M. Cvetković

EINDHOVEN,

- 2 -

On the other hand, public transportation is very good. I experienced that a well-organized group, called "International Neighbours", helps receiving foreign guests at our University. I think that part of the salary from you Faculty, together with the fellowship, would make a stay of you and your family possible. Your son could go to a Dutch school. Many Dutchmen speak English and German.

I am willing to give you any further information you would wish to ask, and I await your further notice.

Sincerely yours,



J.J. Seidel.

Visoko, 4. XI 1974.

Dragi Dragas!

Javljam Ti se prvi put na odsluženja  
vojnog roka. Iz karte koju si ranije primio  
znaš gde sam.

Ovde, na žalost, nije onako dobro kao  
što je Tebi bilo, ali "gora se" i vreme ipak  
prolazi. Svi su izgledi da ću ovde ostati do  
kraja.

Uprkos napornom radu imam dosta slobod-  
nog vremena, te pokušavam nešto čačkati i  
sa grafovima. Trinajstiči sam poslao već  
dva rukopisa o nekim primenama u kemiji, no  
mislim da oni nisu od većeg interesa za Tebe.  
Zanimao sam se "parnošću" Kekuléovih struktura,  
či "parnošću" 1-faktora.

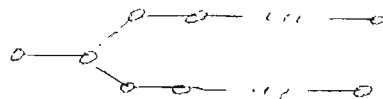
Neka su  $k_1, k_2, \dots, k_k$  1-faktori nekog grafa.  
Neka je superpozicija (graña) grafova  $k_i$  i  $k_j$  označena  
sa  $S_{ij}$ . Znamo da je  $S_{ij}$  "Sachsov graf".  
Označimo broj 4m-čanih kontura u  $S_{ij}$  sa  $R(S_{ij})$ .  
1-faktore delimo na "parne" i "neparne" ako  $\xi$  se  
jednačina

$$P_i P_j = (-1)^{R(S_{ij})} \quad (1)$$

Ovi primen pokazuju, to da su Trojci  
(a i tuda) rezultati, gde se pojavu parnosti,  
1-faktora svodi na parnost jedne permutacije,  
principijelno ograničen na bikromatske grafove.  
(Mislim na pojavlje u Trojci knjizi)

Interesuje me Troje mišljenje o svemu  
ovome. Da li bi mogao dokazati Teorem?  
Da li bi se definicija parnosti mogla učiniti  
elegantnijom nego što je sada. (1)?

Kao što rekoh imam dosta slobodnog vre-  
mena. Zato bih rado rešavao neke situacije (za  
mene dostupne) probleme iz Teorije grafova. Ako  
bi imao neke za mene zanimljive članke, bio  
bih vrlo sretan da mi ih pošaljete. Posebno bih  
Te molio da mi pošaljete kopiju rada Hofmanna  
(ako se ne varam) o maks. sopstvenoj vrednosti  
grafova



(To je u jednoj knjizi.)

Na kraju, interesira me da li ima nešto  
novog u vezi naših dva članka koji su poslani u  
štampu. Da li su recenzije dobivene?

može zadovoljiti za sve  $i, j$ . Oude  $p_i = +1$  ako je  $k_i$  "paran", a  $p_i = -1$  ako je  $k_i$  "neparan" 1-faktor.

Navedeni iskaz može se smatrati definicijom.

Mislim da će se doći do toga da bi sledeći teorem bio od nekakvog značaja

### Teorem

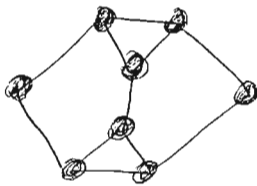
Jednačina (1) može se uvek zadovoljiti ako se posmatrani graf bikromatski

(Drugim rečima. 1-faktor bikromatskog grafa mogu se, u skladu sa jednačinom (1) deliti na parne i neparne.)

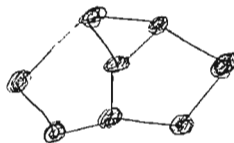
Ja, sada, nemam nikakvog načina da to dokažem, mada, ~~je~~ kao što znaš, ovaj rezultat bio već ranije korišten u nekim našim radovima.

Teorem je za mene sada dobio značaj zato što sam našao primere nebihromatskih grafova čiji se 1-faktor ne mogu deliti na parne i neparne. Jedan jednostavan primer

je



i



Kako napreduje Tvoja i Sachsova knjiga?  
Imaš li možda nekih novih rezultata u  
vezi onoga što se može konstiti u hemiji?

Vrlo će me radovati ako dobijem neke  
vesti od Tebe. Primi srdačne pozdrave

Ivan

ADRESA

IVAN GUTMAN  
71300 VISOKO  
V.P. 6472/3

P.S.

Da li si dobio separate našeg rada u  
Croatica Chemica Acta? Rad se pojavio samo  
dva-tri dana pre mog odlaska u JNA.

Jlmenau, 4.11.74

Lieber Herr Cvetković!

Heute erhielt ich Ihre Sendung vom 21.10.74

mit "miscellaneous results", "exercises"  
und Bildskizzen sowie der Photokopie Ihrer  
Arbeit "Graphs and linear algebra, I."

Für alles herzlichsten Danke! Ich hoffe, daß  
Sie inzwischen auch meine Briefe erreicht

haben? Endlich bin ich in der Lage, auch  
Ihnen wieder ein paar Seiten zu schicken,  
nämlich pp. 22 - 28 und F1, F2 von Kapitel 1.

Inzwischen habe ich aber noch einige andere  
Dinge erledigt: Erstens habe ich eine  
komplette Literaturkartei anfertigen lassen:  
Das schien mir unaufschiebbar, da ich sonst  
die Übersicht sehr bald verloren hätte.

Es ist ja enorm, was Sie alles zusammen-  
getragen haben! Die Kartei hat über 500  
Karten, zusammen gestellt aus 19 verschiedenen  
Listen und Verzeichnissen (die meisten von  
Ihnen); das war ziemlich zeitaufwendig.  
Nun liegt aber alles in einheitlicher Form

vor, und ich glaube, das ist doch ein Schritt  
vorwärts. Die Kartei kann jederzeit ergänzt  
werden, bitte schicken Sie weiterhin Referenzen.  
Ich möchte das Literaturverzeichnis nach  
dem Muster von Harary ("Graph Theory")  
einrichten, ich glaube, Sie werden einverstanden  
sein. - Zweitens wurden die Abbildungen  
normgerecht neu gezeichnet; einige Bilder  
sind noch nachzutragen. - Drittens laufe  
ich die Tabellen überarbeiten, zum Teil ergänzen  
und neu schreiben; Der Verlag stellt da  
gewisse Bedingungen an gute Lesbarkeit.  
Nun muß ich vor allem weitermachen im  
eigentlichen Text - allerdings wird es wieder  
eine Unterbrechung geben, da ich an einem  
Lehrgang teilnehmen muß.

Wir hatten hier Herrn Dr. Jucovič aus  
Košice (C'sSR) zu Gast für 4 Wochen:  
Er hat sehr interessante Vorträge über  
die Konstruktion von Polyedern mit  
gegebenen Eigenschaften (vorgeschriebene  
Valenzen u. s. w.) gehalten; Sie kennen ihn  
vom letzten IWK.

Mit recht herzlichen Grüßen,  
auch an Ihre lieben Angehörigen!

Ihre Host Sachs und Frau

14.11.1974

Prof. J. J. Seidel  
Technological University  
Eindhoven  
Department of Mathematics  
POB 513  
Eindhoven  
The Netherlands

Dear Professor Seidel,

Thank you for your letter of 25.10.74 and for the list of your papers as well as for the paper by A.J.L. Paulus. I shall soon apply officially for the research fellowship from your university. Some details are to be still clarified (for example, my wife is an electro engineer working at a school, and since she wishes to keep her job after the return from the Netherlands, she made an application into that direction).

I would like to ask you for the following information.

1. During my stay in the Netherlands I would enjoy the health insurance, but my wife and child would be treated as tourists and would have that insurance only for three months. Though, there is a possibility of prolongation of that insurance from time to time, I would like to know whether your university ensures any health insurance, and in the case of a negative reply, may I, by a certain payment and under some conditions ensure that health insurance in the Netherlands for them?
2. Whether a ~~memo~~ filling in of the application form forwarded to me by your kindness is sufficient for the participation into the fellowship contest, or any kind of official support by the institution or state authority is needed?

Thanking you in advance for your kindness in replying to my questions, I am, Sir,

Yours respectfully

Dragoš Cvetković





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DDR-108 Berlin, Johannes-Dieckmann-Straße 10 Postf. cl. 1216

Herrn

Dr. D. Cvetković

11 000 B e o g r a d

Lamartinova 44

Jugoslawien

Ihr Zeichen:

Ihre Nachricht vom

Unser Zeichen/Hausnr.:

Tag

At/Hz

15.11.74

Betrifft

Spectra of Graphs

Sehr geehrter Herr Dr. Cvetković,

besten Dank für Ihr Schreiben vom 3.9.74.

Ihrem Wunsch, 10% des Anteils an Ihrem Honorar in der DDR belassen zu wollen, werden wir gern entsprechen, und einen entsprechenden Passus in den Vertrag aufnehmen.

Auch wir sind daran interessiert, baldmöglichst einen Autorenvertrag abzuschließen. Die von Ihnen gewünschte Garantieerklärung bezüglich der Zahlung eines Teils des Honorars in frei konvertierbarer Währung können wir - wie uns unser Büro für Urheberrechte auf unsere Anfrage hin mitteilte - nur dann in den Autorenvertrag aufnehmen, wenn bereits ein Vertrag mit dem betreffenden ausländischen Verlag über das Objekt abgeschlossen wurde.

Zu unserem großen Bedauern müssen wir Ihnen mitteilen, daß der Verlag Academic Press in der Zwischenzeit die Beteiligung an diesem Publikationsvorhaben abgelehnt hat. Wir werden daher zunächst einen Verlagsvertrag vorbereiten, der die Beteiligung eines

- 2 -

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Herrn  
Dr. Michael Doob  
Assistent Professor  
The University of Manitoba  
Department of Mathematics and Astronomy  
W i n n i p e g, Canada  
R3T 2N2

Ihr Zeichen

Ihre Nachricht vom

Unser Zeichen/Hausruf

Tag

At/Hz

15.11.74

Betrifft

Spectra of Graphs

Sehr geehrter Herr Professor,

wir bestätigen dankend den Eingang Ihres Schreibens vom 30.9., mit dem Sie uns die erbetenen Angaben übermittelten. Zu unserem großen Bedauern hat sich die Ausfertigung der Verträge dadurch etwas verzögert, daß der Verlag Academic Press die Beteiligung an diesem Publikationsvorhaben abgelehnt hat. Wir setzen jedoch unsere Bemühungen, einen anderen ausländischen Verlag für das Vorhaben zu interessieren, fort und wären Ihnen sehr dankbar, wenn Sie uns dabei eventuell durch Hinweise unterstützen könnten.

Unabhängig davon werden wir nun Verträge vorbereiten, die die Beteiligung eines weiteren Verlages an der Herausgabe der o.g. Monographie offen lassen, und gegebenenfalls später Sondervereinbarungen treffen.

Bis zur Übersendung des Vertrages bitten wir Sie jedoch um etwas Geduld.

Mit vorzüglicher Hochachtung  
und freundlichen Grüßen  
VEB DEUTSCHER VERLAG DER WISSENSCHAFTEN

*W. Arnold*  
Dr. Walter  
Verlagsleiter

*W. Arnold*  
Arnold  
Abteilungsleiter

Blatt 2 zum Schreiben vom 15.11.74 an Herrn Dr. D. Cvetković

ausländischen Verlages offen läßt, und gegebenenfalls später Sondervereinbarungen treffen, wenn es uns gelungen ist, einen anderen Verlag für das Vorhaben zu interessieren. Bis zur Übersendung des Vertrages möchten wir Sie jedoch um etwas Geduld bitten.

Mit vorzüglicher Hochachtung  
und freundlichen Grüßen  
VEB DEUTSCHER VERLAG DER WISSENSCHAFTEN

Dr. Walter  
Verlagsleiter

Arnold  
Abteilungsleiter

TECHNOLOGICAL UNIVERSITY EINDHOVEN - Department of Mathematics

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THE NETHERLANDS

Prof. D. Cvetković

Dept. of Mathematics, Faculty of  
Electrical Engineering, University of  
Beograd, P.O. Box 816

11.001 BEOGRAD

Yugoslavia.

EINDHOVEN,

November 26, 1974

Dear Professor Cvetković,

In reply to your letter of November 14, 1974, I have the following answers to your questions.

1. The accompanying sheet contains all information about insurance.
2. The custom is that you personally apply. We do not need any official support.

If you have any further questions please let me know.

Yours sincerely,

P/o J. J. Seidel (secretary).  
J.J. Seidel.

Dragoš Cvetković

27.11.1974

Prof. J.J.Seidel  
Eindhoven University of Technology  
Department of Mathematics  
Eindhoven  
POB 513

Dear Professor Seidel,

I wish to inform you that today I sent the official application form for getting the research fellowship from your University.

Thank you again for the help which you extended to me.

Please let me know when the results of the applications for fellowship will be known.

Sincerely

Dragoš Cvetković

Dragoš Cvetković

27.11.1974

EINDHOVEN UNIVERSITY OF TECHNOLOGY  
POB 513  
Eindhoven,  
The Netherlands

Dear Sirs,

I apply hereby for getting the research fellowship of your University for the research project "Graph Theory" (Prof. Dr. J. J. Seidel).

Please find enclosed herewith the application form and a list of my publications.

Yours respectfully

Dragoš Cvetković

Košice / ČSSR

16. 12. 74

Lieber Herr Cvetković!

Endlich komme ich dazu, Ihnen zu schreiben! Es ist nun doch einiges zu berichten, aber zunächst muß ich noch den Empfang zweier Sendungen, für die ich Ihnen sehr danke, bestätigen:

Ein Brief vom 12. 11. mit verschiedenen Bemerkungen und ein Brief vom 15. 11. mit Ergänzungen zu Kapitel 6. Leider hat es bei mir im letzten Monat wieder viele Unterbrechungen gegeben - Lehrgang, Konferenz, Forschungsverteidigungen und diverse Arbeiten, die immer am Jahresende zu machen sind, Gutachten, Rezensionen, ... - jetzt bin ich seit einer Woche bei Herrn Jucovič in Košice und habe mir die wichtigste Arbeit hierher mitgenommen, doch leider, als ich hier ankam, warf mich eine starke Erkältung um; jetzt geht es mir wieder etwas besser. Nun, ich will mich nicht beklagen - wenn ich nur mit dem Manuskript schneller vorankäme! Wir müssen ja auch unbedingt Herrn Doob zufrieden stellen.

Im November erhielt ich einen Brief vom VEB DVW, in dem Herr Arnold mitteilt, daß „der Verlag Academic Press in der Zwischenzeit die Beteiligung an diesem Publikationsvorhaben abgelehnt hat.“ Das war ein schwerer Schlag! Ich nehme an, daß Sie auch informiert worden sind? Ich bin darauf hin nach Berlin <sup>gefahren</sup> (konnte das mit meiner Teilnahme an einer dreitägigen Konferenz beim Ministerium verbinden); leider war Herr Arnold krank, ich konnte nur mit der Lektoratsleiterin, Fräulein Arndt, sprechen. Sie zeigte mir einen Brief vom September, in dem AP kurz und lakonisch mitteilt, daß es dort personelle Veränderungen gegeben habe und daß eine gewisse Miss Gordon (?), in deren Ressort unser Buch fiel und die nun nicht mehr bei AP angestellt sei, wahrscheinlich vergessen habe, den DVW von der Ablehnung zu unterrichten. (Herr van der Plaas (?) ist ja auch nicht mehr bei AP.) Es gab dann noch eine Rückfrage von DVW bei AP, ob



hier nicht ein Irrtum vorliege, da doch die Initiative von AP ausgegangen ist - nein, es bleibe bei der Entscheidung, es habe im Verlag Veränderungen gegeben (diesen letzten Brief konnte ich leider nicht sehen, da er von Herrn Arnold eingeschlossen worden war). Erst darauf hin hat man uns benachrichtigt - die Entscheidung selbst muss also schon vor geraumer Zeit getroffen worden sein. - Ich war natürlich ziemlich enttäuscht und machte mir Vorwürfe, dass es an mir liegt, weil ich nicht vorankomme - aber die Kollegen vom DVW benachrichtigen mich, die Gründe liegen ganz in inneren Angelegenheiten des AP: Personelle Veränderungen, Zusammenschluss mehrerer Verlage, allgemeine Rezessionserscheinungen, Zurückgehen der Absatzmöglichkeiten im Bereich der Naturwissenschaften u.z.w.... Na, trotzdem war ich ziemlich deprimiert. DVW hat nun fest versprochen, auf keinen Fall vom Vertrag (dem geplanten) zurückzutreten, obwohl ~~ihre~~ seine geschäftlichen Erwartungen durch das Zurücktreten von AP auch stark geschmälert wurden. Ich habe nun als Manuskriptabgabetermin den 31. 3. 75 genannt, damit endlich der Vertrag rechtskräftig

abgeschlossen werden kann und keine weiteren Pannen eintreten. Jetzt liegt es an mir, Zeit zum Arbeiten zu finden! (In der vorlesungsfreien Zeit im Januar muß ich wieder an einem einwöchigen Kursus teilnehmen.)

Das war das, was mich am meisten bedrückte, und ich bin froh, diese Mitteilung endlich zu Papier gebracht zu haben. Hoffentlich sind Sie selbst nicht allzu sehr enttäuscht. Kein schönes Weihnachtsgeschenk. -

Dap ich auf 500 Karteikarten gekommen bin, liegt daran, dap ich für jeden Autor bei jeder Arbeit eine eigene Karte geschrieben habe - die Anzahl der Arbeiten selbst ist vielleicht nur gut halb so groß.

Lieber Herr Cvetković, ich möchte nun noch zum Abschluß des Briefes Ihnen, Ihrer lieben Frau und Ihrem Sohn sowie all Ihren Verwandten in Beograd und Vršac eine recht angenehme Weihnachtszeit und alles, alles Gute - Gesundheit, Glück und Erfolg - im Neuen Jahr wünschen!

Mit den herzlichsten Grüßen!

Ihre  
Barbara und Horst Sachs  
(Jemenau) (Košice)

Mathematical Institute, Belgrade  
11000 Belgrade, Yugoslavia  
Knez Milojevića 35

Prof. Dr. rer. mat. habil. Horst Sachs

Technische Hochschule Ilmenau

DDR 63 Ilmenau

Am Ehrenberg, Block G

Dear Professor Sachs,

Sarjali smo da imate namenu da učestvujete  
u radu Balhauslog mat. kongresa (Balcan Mathematical  
Congress) u junu ove godine u Beogradu. ~~To bi~~ <sup>zamoćimo i</sup>  
~~bilo~~ ~~tepa~~ Tim povodom slobodni smo da Vas pozovemo  
da u Matem. institutu u Sekciji za komb. matem. održite  
jedno ili više predavanja iz oblasti teorije grafova. O  
bju predavanja i slicnim pojedinostima dogovorili bi  
se kasnije. Vaša predavanja bi bila honorisana prema  
pravilniku Instituta.

Vaše prisustvo u Institutu bi ozvolilo predložak  
podstrek za investiciju broj mladih matematičara koji  
počinju da se bore kombinat. matem. pa se nadamo  
da ćete našoj molbi reći u susret.

Dear Professor Soehls,

U znak zahvalnosti za pomoć koju ~~ste~~ mi  
puzili mi izradi dobrotne disertacije ~~te~~ i gostoprimstva  
koje ste mi ukazali u GDR i ljubavnom na moju  
porodicu koje traje već nekoliko godina, slobodan  
sam da Vas i Vašu suprugu pozovem da budete  
moji gosti u Jugoslaviji tri nedelje između juna  
i početkom jula. To bi bila prilika da posetite  
Balk, met, konz. i 20 umet. sa jugosl. metem. Tolsto  
je Metem, met. u Beđ zainteresovan da održi nekoliko  
predavanja u Institutu o teoriji profana. Naravno,  
jeden ili dva brova u Jugoslaviji biste posetili  
odluom.